CyberGuard® Firewall Manual

Configuring the CyberGuard® Firewall

CyberGuard® Firewall for UnixWare®

CYBERGUARD CORPORATION

FW001-080
November 2003

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Release	Date	Level	Effective With
Original Release	January 1996	0840055-000 0840056-000	CyberGuard 2.1 (CX/SX 6.2)
Previous Release	October 2002	FW001-070	CyberGuard 5.1 (UnixWare 2.1.3)
Current Release	November 2003	FW001-080	CyberGuard 5.2 (UnixWare 2.1.3)

See the *CyberGuard Firewall Release Notes* for a detailed description of the changes from CyberGuard Firewall Release 5.1 to CyberGuard Firewall Release 5.2.

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Preface

The *CyberGuard Firewall Manual* consists of three volumes: *Administering the CyberGuard Firewall*, *Configuring the CyberGuard Firewall*, and *Configuring SmartProxies for the CyberGuard Firewall*. These volumes document the configuration of the CyberGuard® Firewall, system maintenance, report generation, and the functions of the graphical user interface (GUI). They also explain how to perform common tasks. Each configurable component of the firewall is documented in three sections: an overview, a description of its configuration using the GUI, and a description of the underlying files and commands that can be used for background information or for verification of the GUI by the advanced user. The contents of each volume are described in What Is in the CyberGuard Firewall Manual? The entire manual is available in both hardcopy and online (HTML and PDF) formats.

The *CyberGuard Firewall Installation Guide* explains the procedures for hardware configuration and setup of the CyberGuard Firewall.

Who Should Read This Manual?

This manual is written for network administrators who want basic and advanced, hands-on information about how to install and use the CyberGuard Firewall system. General knowledge of Motif™-based graphical user interfaces, UNIX® files and commands, and networking concepts is assumed.

What Is in the CyberGuard Firewall Manual?

Each volume of the *CyberGuard Firewall Manual* contains a complete Table of Contents, Glossary, and Index as well as the information described below. For quick and easy access to information, the volume number is represented in the page number as well as in figure and table numbers. For example, page 215 in Volume 2 is represented as II-215.

Volume 1, "Administering the CyberGuard Firewall," contains information relating to setting up and administering your firewall. You will learn about the Graphical User Interface, Secure Remote Management, Central Management, and High Availability. This volume also contains information about the extensive reports and tools provided with the CyberGuard Firewall. Additional information is about the firewall is included in Appendixes.

Volume 2, "Configuring the CyberGuard Firewall," contains information required to configure the CyberGuard Firewall. Each menu item from the Configuration menu, except for SmartProxies, is described in this volume.

Volume 3, "Configuring SmartProxies for the CyberGuard Firewall," describes and explains configuration procedures for each of the SmartProxies of the CyberGuard Firewall. This volume also explains how to design and implement your own SmartProxies.

CAUTION!

Screen captures and graphics in this manual are intended as examples and do not necessarily represent a proper or complete configuration or the configuration that is appropriate to your company's needs. Often features are enabled so they are clear in the screen capture. Not all features are appropriate or desirable for your firewall setup.

Conventions

The following conventions are used throughout this documentation:

italic	New terms, book titles, emphasized words or phrases, variable user input, and cross-references in the Glossary appear in italic type.
bold	Menu items, field names, default values, push buttons, command names and options, system manual page references, directories, and file names appear in bold type. User input for the GUI, which must be entered *exactly* as shown, also appears in this type.
`code`	Value ranges, file samples, and output such as prompts and messages appears in this type.
`code bold`	User command input appears in code bold type and must be entered exactly as shown. Command syntax also appears in this type.
`keyboard`	Keyboard keys appear in this type.
[ ]	Brackets indicate that an element of a file or command is optional. Do not type the brackets if you use the option or argument.
|	This symbol represents a choice between options, arguments, keywords, or values. When this symbol is present in a file format listing or command syntax, choose one of the items. Do not type this symbol when you choose an option.
\	A backslash is used at the end of a text or command line to indicate continuation onto the next line. Do not type the backslash.

Related Publications

The following publications and sources contain information related to this book:

online	(UnixWare) Network Administration
online	(UnixWare) System Administration
online	(UnixWare) System Owner Handbook
RN001	CyberGuard Firewall Release Notes
IN001	CyberGuard Installation Guide

vendor-supplied	*CSMART User's Guide*
vendor-supplied	*FullTimeHA+ Installation and Configuration Guide for UnixWare*, provided by Legato Systems, Inc.
vendor-supplied	SecurID, SecureNet Key, and RADIUS documentation

vendor-supplied Websense Enterprise documentation, provided by Websense, Inc.

vendor-supplied *WebTrends for Firewalls and VPNs*, provided by WebTrends Corporation

http://www.merit.edu GateD daemon information

consortium-interest@gated.merit.edu
E-mail address for the GateD Consortium

HOSTMASTER@INTERNIC.NET
E-mail address for the NIC

http://www.socks.permeo.com/AboutSOCKS/SOCKSOverview.asp
SOCKS information

http://www.redcreek.com Red Creek information and documentation:
- **MN-00017 B** Ravlin IPSec Card Hardware and Installation Guide
- **MN-00015 A** Ravlin IPSec Card RavlinNodeManager User's Guide
- **MN-00002 C** RavlinSoft User's Guide

http://www.3com.com/other/pdfs/infra/corpinfo/en_US/501302.pdf
"Understanding IP Addressing: Everything You Ever Wanted to Know"

http://tycho.usno.navy.mil/ntp.html
US Navy site with list of NTP servers

ISBN 1-56592-124-0 *Building Internet Firewalls* by D. Brent Chapman and Elizabeth D. Zwicky, published by O'Reilly & Associates, Inc.

ISBN 0-201-63357-5 *Firewalls and Internet Security* by Cheswick and Bellovin, published by Addison Wesley.

ISBN 1-56592-010-4 *DNS and Bind* by Albitz and Lui, published by O'Reilly & Associates, Inc.

ISBN 0-937175-82-X *TCP/IP Network Administration* by Craig Hunt, published by O'Reilly & Associates, Inc.

ISBN 1-56592-056-2 *sendmail* by Bryan Costales with Eric Allman and Neil Rickert, published by O'Reilly & Associates, Inc.

RFC 793 "Transmission Control Protocol"
RFC 974 "Mail routing and the domain system"
RFC 1032 "Domain administrators guide"
RFC 1033 "Domain administrators operations guide"
RFC 1034 "Domain names - concepts and facilities"
RFC 1035 "Domain names - implementation and specification"
RFC 1058 "Routing Information Protocol"
RFC 1075 "Distance Vector Multicast Routing Protocol"
RFC 1101 "DNS encoding of network names and other types"
RFC 1112 "Host extensions for IP multicasting"

RFC 1213	"Management Information Base for Network Management of TCP/IP-based internets"
RFC 1535	"A Security Problem and Proposed Correction With Widely Deployed DNS Software"
RFC 1536	"Common DNS Implementation Errors and Suggested Fixes"
RFC 1537	"Common DNS Data File Configuration Error"
RFC 1706	"DNS NSAP Resource Records"
RFC 1876	"A Means for Expressing Location Information in the Domain Name System"
RFC 2138	"Remote Authentication Dial In User Service (RADIUS)"
RFC 2317	"Classless IN-ADDR.ARPA delegation"
RFC 2401	"Security Architecture for the Internet Protocol"
RFC 2402	"IP Authentication Header"
RFC 2406	"IP Encapsulating Security Payload (ESP)"
RFC 2407	"The Internet IP Security Domain of Interpretation for ISAKMP"
RFC 2408	"Internet Security Association and Key Management Protocol (ISAKMP)"
RFC 2409	"The Internet Key Exchange (IKE)"
RFC 2560	"X.509 Internet Public Key Infrastructure Online Certificate Status Protocol - OCSP"

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Chapter 1
Host Names

Your system can always use Internet Protocol (IP) addresses to communicate with other systems (hosts) in a network or other networks. However, people usually recall host and network names better than addresses. This chapter shows how to associate IP addresses with names.

Host Names Window

Your system communicates with other systems (hosts) in a network by using an Internet Protocol (IP) address; however, host names are easier to remember than IP addresses. Use this window to view, add, change, or delete hosts. Changes to host information take effect as soon as they are saved.

Notes:

- This window defines host names for use by only the firewall. To define host names and make them available to other hosts on the network, use the Split Domain Name System (DNS).
- The Packet-Filtering Rules window and the Static Routes page of the Routes window use hosts from this window; changes to the Network Interfaces window may add hosts to this window.

Tip: Define host names for systems that the firewall will need to initiate connections to, for example, mail, the World Wide Web, and DNS servers, or other systems that have special permissions in packet-filtering or proxy client rules. You do not need to add entries for systems that the firewall does not reference.

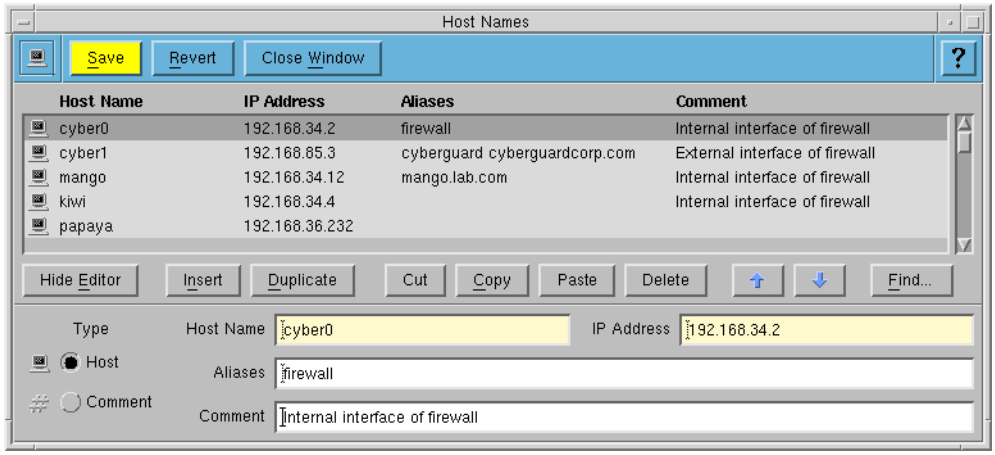


Figure II-1. Host Names Window (Expanded)

The expanded version of this window contains the following fields and controls:

Type Has the following settings:

Host - (Default) Treats this line as a host description
Comment - Treats this line as a comment

Host Name Unique primary name of the host that is distinct from network and group names. Portable host names must contain only alphanumeric characters.

IP Address Address used by the Internet Protocol to communicate with the host.

Aliases Secondary names for the host. (An alias can separate a functional name from a host name. For example, you might use *mail* as an alias for a host that processes mail. If you change the host that processes mail, you simply move the alias to the other host.) Portable aliases must contain only alphanumeric characters. The names are separated by spaces. This field may be blank.

Comment Information about the host, such as its hardware address, or a commented-out host description. This field may be blank.

CAUTION!

Do not use underscores in host names or aliases. The Split Domain Name System (DNS) will not work if underscores are used. Furthermore, under current Internet standards, underscores are not valid characters for host names.

See also:

- "Window Components" on page I-10
- "Find Window" on page I-30
- "Network Interfaces Window" on page I-68
- "Packet-Filtering Rules Window" on page II-22
- "Routing Window" on page II-83
- "Split Domain Name System Window" on page II-114

How to Configure Host Names

You can use the expanded Host Names window to add a name to the host list when you add a system to your local network, correct an error in a host name or Internet address, add or change an alias, or add or change a comment.

To display the expanded Host Names window:

1. Select **Configuration** from the Control Panel.
2. Select **Host Names**. The Host Names window appears.
3. Click on **Show Editor**. The expanded Host Names window appears.

To add a host to your network:

1. (Optional) Select the host that you want the new host to follow. (Skip this step if you want to add a new host at the top of the list.)
2. Click on **Insert**. A blank line appears in the list. The **Type** field is set to **Host**.
3. Type the primary host name in the **Host Name** field.
4. Type the Internet address in the **IP Address** field.
5. (Optional) Type a space-separated list of any aliases for the host in the **Aliases** field.
6. (Optional) Type any comments in the **Comment** field.
7. Click on **Save**.

To change a host:

1. Select the host that you want to change.
2. Edit the fields that you want to change.
3. Click on **Save**.

To delete a host:

1. Select the hosts that you want to delete.
2. Click on **Delete**. The selected lines are removed from the list.
3. Click on **Save**.

Host Names - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

Host Names Database File (hosts)

The **/etc/inet/hosts** file is the host name database, which lists the hosts' Internet Protocol (IP) addresses along with names that can be used in place of this address. This file can be used to define the local host, internal hosts, external hosts, and your Internet Service Provider. Each network interface should have an entry in the **hosts** file. One entry should relate the system node name to one external interface.

Format guidelines:

- Each host must be listed on a separate line
- Fields are separated by white space (tabs or spaces)
- Comments begin with the # character and continue until the end of the line

Format:

address name [*aliases*]

Fields:

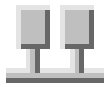
address	Internet Protocol (IP) address assigned to the host system.
name	Host name assigned to the host system. Use alphanumeric names only.
aliases	(Optional) One or more alternate host names assigned to the system.

The following example shows a typical **hosts** file.

```
# /etc/inet/hosts
127.0.0.1      localhost  loopback                      # Loopback interface
192.168.34.2   cyber0     firewall                      # Internal interface of firewall
192.168.65.3   cyber1     cyberguard  cyberguardcorp.com  # External interface of firewall
192.168.34.12  mango      mango.lab.com                 # Internal interface of firewall
192.168.34.4   kiwi                                     # Internal interface of firewall
```

Figure II-2. Host Names Database File Example

Chapter 2
Network Names



Your system can always use Internet Protocol (IP) addresses to communicate with other systems (hosts) in a network or other networks. However, people usually recall host and network names better than addresses. This chapter shows how to associate IP addresses with names.

Network Names Window

Your system communicates with other networks by using an Internet Protocol (IP) address; however, network names are easier to remember than IP addresses. Use this window to view, add, change, or delete networks. Changes to network information take effect as soon as they are saved.

Tip: You may want to define network names for each network to which the firewall is directly connected as an easy way to reference each interface in the packet-filtering rules. You may also want to name the other networks you reference in packet-filtering or routing rules. You do not need to name networks that the firewall does not reference.

Note: The Packet-Filtering Rules window and the Static Routes page of the Routes window use networks from this window.

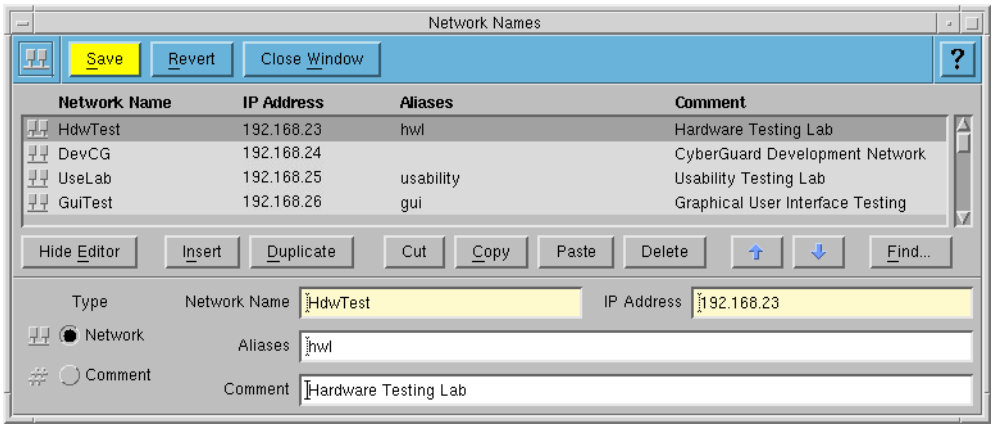


Figure II-3. Network Names Window (Expanded)

The expanded version of this window contains the following fields and controls:

Type — Has the following settings:

Network - (Default) Treats this line as a network description
Comment - Treats this line as a comment

Network Name — Unique primary name of the network that is distinct from host and group names. Portable network names must contain only alphanumeric characters.

IP Address — Internet Protocol network address. This address consists of 1, 2 or 3 octets, depending on whether the network is class A (1 octet), B (2 octets), or C (3 octets). This must be a classful network IP address; it cannot be a classless IP address. See the **inet(3N)** UnixWare system manual page.

Aliases — Secondary names for the network. (For example, you might add an old network name to a new network name during a network upgrade so that traffic for the old network is routed to the new network.) Portable aliases must contain only alphanumeric characters. The names are separated by spaces. This field may be blank.

Comment — Information about the network, such as its hardware address, or a commented-out network description. This field may be blank.

CAUTION!

Do not use underscores in host names or aliases. The Split Domain Name System (DNS) will not work if underscores are used. Furthermore, under current Internet standards, underscores are not valid characters for host names.

See also:

- "Window Components" on page I-10
- "Find Window" on page I-30
- "Packet-Filtering Rules Window" on page II-22
- "Routing Window" on page II-83
- "Split Domain Name System Window" on page II-114

How to Configure Network Names

You can use the expanded Network Names window to add a network to the list when you connect your system to a new network, correct an error in the network name or Internet address, add or change an alias, or add or change a comment.

To display the expanded Network Names window:

1. Select **Configuration** from the Control Panel.
2. Select **Network Names**. The Network Names window appears.
3. Click on **Show Editor**. The expanded Network Names window appears.

To add a network:

1. (Optional) Select the network that you want the new network to follow. (Skip this step if you want to add a new network at the top of the list.)
2. Click on **Insert**. A blank line appears in the list. The **Type** field is set to **Network**.
3. Type the primary network name in the **Network Name** field.
4. Type the Internet address in the **IP Address** field.
5. (Optional) Type any aliases for the network in the **Aliases** field, separating them with spaces.
6. (Optional) Type any comments in the **Comment** field.
7. Click on **Save**.

To change a network:

1. Select the network that you want to change.
2. Edit the fields that you want to change.
3. Click on **Save**.

To delete a network:

1. Select the networks that you want to delete.
2. Click on **Delete**. The selected lines are removed from the list.
3. Click on **Save**.

Network Names - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

Network Names Database File (networks)

Add, delete, or change network names using the **/etc/inet/networks** file.

File guidelines include:

- Each network appears on a separate line
- Fields are separated by white space (tabs or spaces)
- Comments begin with the # character and continue until the end of the line

Format:

network_name network_number [*aliases*]

Fields:

network_name	Name assigned to the network. Use alphanumeric names only.
network_number	Network number assigned to the network.
aliases	(Optional) One or more alternate network names for the network.

The following example shows a typical **networks** file.

```
# /etc/inet/networks
HdwTest   192.168.23    hwl          # Hardware Testing Lab
DevFW     192.168.24                 # Firewall Development Network
UseLab    192.168.25    usability    # Usability Testing Lab
GuiTest   192.168.26    gui          # Graphical User Interface Testing
```

Figure II-4. Network Names Database File Example

Chapter 3
Grouping

The CyberGuard Firewall recognizes three distinct types of groups: services groups, firewall groups, and Central Management Target Groups. A *services group* is a named set of network services. A *firewall group* is a named set of IP addresses, host, network, and other group names. Services and firewall groups are usually used as sources and destinations in the Packet-Filtering Rules window. They are treated as if each member were listed separately. A Central Management *Target Group* is a named set of one or more CyberGuard Firewalls defined as Target Firewall in the Central Management Role window. These firewalls can be listed by host name or IP address.

See also:

- "Central Management" on page I-103
- "Central Management Choices Window" on page I-124
- "Central Management Role Window" on page I-115
- "How to Add Central Management Target Groups" on page I-141
- "How to Configure a Target Group" on page I-142
- "How to Configure Security on a Target Firewall" on page I-145

Grouping Window

Use this window to view, add, change, or delete groups or group members. If the optional Central Management product is installed on the system, use this window to define Target Groups and Target Firewall group members. If the optional Central Management encryption libraries are installed, use this window to configure encryption for groups of Target Firewalls or individual Target Firewalls.

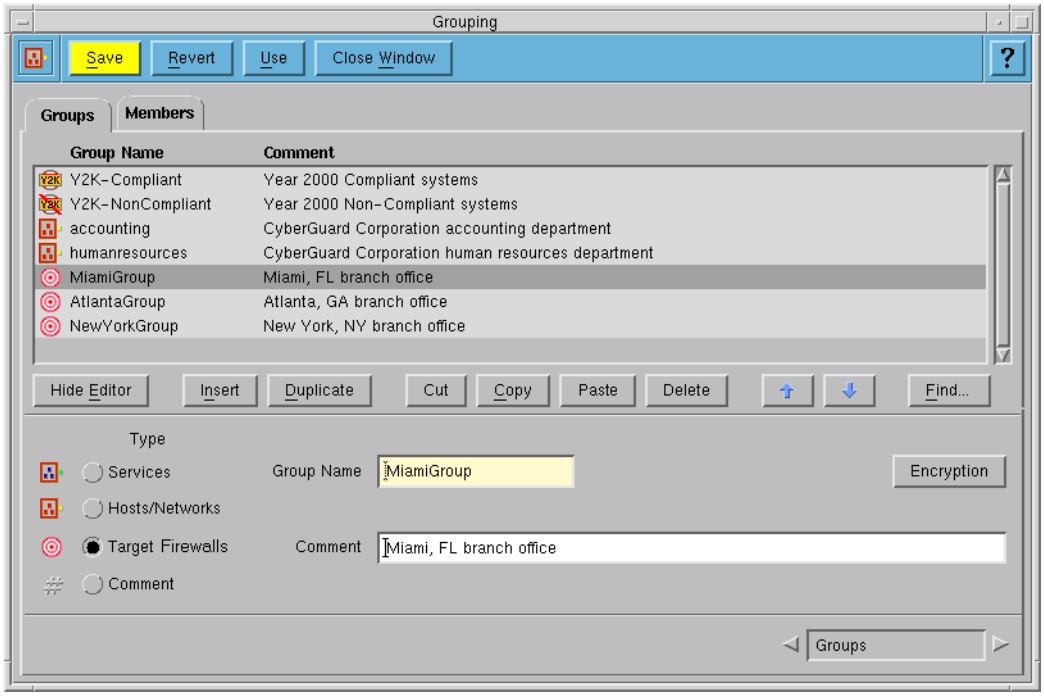


Figure II-5. Grouping Window - Groups Page (Expanded)

Information about grouping appears on two notebook pages: the Groups page and the Members page.

See also:

- “Window Components” on page I-10.
- “Find Window” on page I-30

Groups Page

Use this page of the Groups window to view, add, change, or delete groups.

If the optional Central Management product is installed, use this page to define Target Group names. If the optional Central Management encryption libraries are installed, use this page to configure a Central Management encryption policy which will apply to an entire group of Target Firewalls so that all Target Firewalls in the group will share the same encryption type and encryption keys. If you have a large number of Target Firewalls in centrally managed groups, you may want to simplify your security management scheme by selecting this configuration method. A drawback to this method is that if any of the configured cryptographic keys are compromised, then all members of a centrally managed group which share those same keys may be vulnerable.

The expanded version of this page contains the following fields and control:

Type Has the following settings:

Services
Group name of services.

Hosts/Networks
(Default) Group name of firewall hosts. Also called firewall groups.

When configuring VPN, Hosts/Network groups are convenient way to configure the peer-protected networks for secure channels. These groups exist on the remote side of the IPSec tunnel. When writing the IPSec packet-filtering rules, the underlying VPN connection blocks are built more efficiently when network groups are used. All addresses in a group that are to be tunneled through a secure channel are combined in a single VPN connection block. See “Virtual Private Network (VPN)” on page II-235.

Target Firewalls
Group name of remote Central Management target hosts.

Comment
Treats this line as a comment.

Group Name Unique name of the group that is distinct from service, host, and network names.

Service group names cannot have **%** or / in the name; Host and Target Firewall group names cannot have / in the name.

A group name can also be used to specify multiple networks and hosts that can be used as a valid routing destination. Select the **Host/Networks** type with a routing group. See also “Routing Window” on page II-83.

Comment Information about the group, such as how its members are related. This field may be blank.

Encryption From the Firewall Manager, opens the Encryption window so that a common encryption type and a common set of encryption keys can be applied to all Target Firewalls in a single group. If no optional cryptographic libraries are installed on your CyberGuard Firewall, you must choose **None** and click on **Save** on the Encryption window. Note that encryption that is defined from the Groups page overrides any prior encryption defined from the Members page. For complete information, see "Central Management Security" on page I-110.

Notes:

- Deleting a group does not delete its members from the Host Names and Network Names windows.
- The order in which groups are defined on the Groups page of the Grouping window is significant. Because a group may contain another group as a member, you must ensure that a group is defined before it is referenced. For example, if GroupB is a member of GroupA, GroupB must be defined before GroupA.

See also:

- "Host Names Window" on page II-1
- "Network Names Window" on page II-5
- "Central Management" on page I-103
- "Central Management Choices Window" on page I-124
- "Central Management Security" on page I-110
- "How to Add Central Management Target Groups" on page I-141
- "How to Configure a Target Group" on page I-142
- "How to Configure Security on the Firewall Manager" on page I-144
- "How to Configure Security on a Target Firewall" on page I-145

Members Page

Use this page of the Groups window to view, add, change, or delete group members.

If the optional Central Management product is installed, use this page to define Target Firewall members for Target Groups. If the optional Central Management encryption libraries are installed, use this page to configure encryption for individual Target Firewalls (e.g., each Target Firewall may use the same encryption algorithm, but a different set of encryption keys or each Target Firewall may use a different encryption algorithm with a different set of encryption keys, etc.). This configuration method is recommended as it provides the strongest element of security using encryption. By having different cryptographic keys associated with each Target Firewall, you are ensuring that if only one set of keys or a single key is compromised, then only one system may become vulnerable rather than all systems in a centrally managed group. The drawback to this configuration method is that it requires some degree of management for each Target Firewall, especially if there are a large number of such systems being managed.

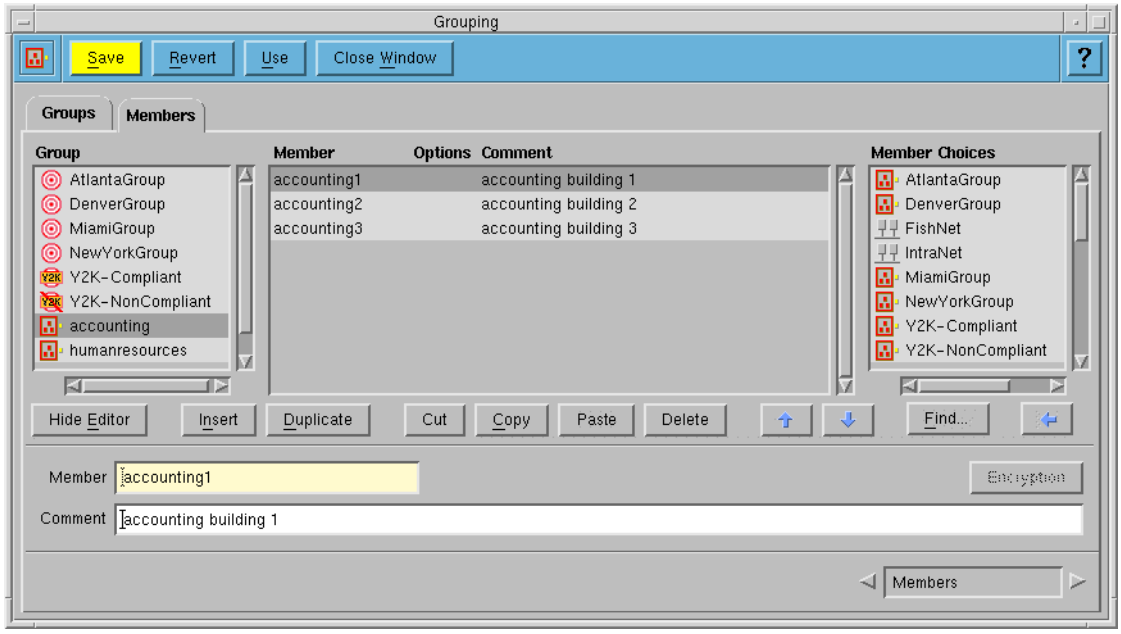


Figure II-6. Grouping Window - Members Page (Expanded)

The expanded version of this page contains the following fields:

Group — Group name. Selecting a group displays its members, options, and comments in the **Member** list.

Member — For service groups, service group name or service name in the format of *service*/*protocol* or *port_number*/*protocol* (for example, `smtp/tcp`, `4000/udp`, or *type*:*code*/**icmp**)). Services can be copied from the **Member Choices** list or typed into the **Member** field.

For firewall groups, group name or primary name, alias, or IP address of a host, network, or interface. Can also be a predefined member of the Packet Origin or Packet Destination list from the Basic page of the Packet-Filtering Rules window. Names can be copied from the **Member Choices** list or typed into the **Member** field.

For Target Groups, Name of Target Firewall copied from the **Member Choices** list. The **Insert** button, **Member** field, and **Comment** field are disabled for Central Management groups. You must choose Target Firewalls from the **Member Choices** list.

Comment — Information about the member, such as its hardware address. This field may be blank. This field is disabled when configuring Central Management groups.

Member Choices For services groups, names of services; For firewall groups, group name or primary name of a host, network, or interface; names come from the Groups page, Host Names window, Network Names window, Interfaces window, and **Packet Origins** and **Packet Destination** fields of the Basic page of the Packet-Filtering Rules window. For Firewall Managers, names of firewalls designated as a Managed Firewall in the Central Management Role window. The left arrow button copies selected members from this field into the **Member** field.

Encryption From the Firewall Manager, opens the Encryption window so that cryptographic support for the selected Central Management Target Firewall can be individually defined. If no optional cryptographic libraries are installed on your CyberGuard Firewall, you must choose **None** and click on **Save** on the Encryption window. Note that encryption that is defined from the Groups page overrides any prior encryption defined from the Members page. For complete information, see "Central Management Security" on page I-110.

Notes:

- Deleting a group member does not delete the member from the Host Names and Network Names windows.
- The left arrow button copies the selected member choices after the last selected line in the **Member** field; copies these choices to the top of the **Member** field if no line is selected in the **Member** field. This button is enabled after a member is selected in the **Member Choices** field.

See also:

- "Window Components" on page I-10
- "Host Names Window" on page II-1
- "Network Names Window" on page II-5
- "Packet Origins and Destinations" on page II-26
- "Central Management" on page I-103
- "Central Management Choices Window" on page I-124
- "Central Management Security" on page I-110
- "How to Add Central Management Target Groups" on page I-141
- "How to Configure a Target Group" on page I-142
- "How to Configure Security on the Firewall Manager" on page I-144
- "How to Configure Security on a Target Firewall" on page I-145

How to Add or Change a Group

You can use the expanded Groups page of the Grouping window to add a name to the group list or add or change a comment.

Note: The order in which groups are defined on the Groups page of the Grouping window is significant. Because a group may contain another group as a member, you must ensure that a group is defined before it is referenced. For example, if GroupB is a member of GroupA, GroupB must be defined before GroupA.

To display the expanded Groups page of the Grouping window:

1. Select **Configuration** from the Control Panel.
2. Select **Grouping**.
3. Click on the **Groups** tab. The Groups page of the Grouping window appears.
4. Click on **Show Editor**. The expanded Groups page appears.

To add a group:

1. (Optional) Select the group that you want the new group to follow. (Skip this step if you want to add a new group at the top of the list.)
2. Click on **Insert**. A blank line appears in the list. The **Type** field is set to **Hosts/Networks**.
3. (Optional) To configure a Target Group for a Firewall Manager, select **Target Firewalls** in the **Type** field.
4. Type the group name in the **Group Name** field.
5. (Optional) Type any comments in the **Comment** field.
6. Click on **Save**.

To change a group:

1. Select the group that you want to change.
2. Edit the fields that you want to change.
3. Click on **Save**.

To delete a group:

1. Select the groups that you want to delete.
2. Click on **Delete**. The selected lines are removed from the list.
3. Click on **Save**.

See also:

- “Central Management” on page I-103
- “Central Management Choices Window” on page I-124
- “Central Management Security” on page I-110
- “How to Add Central Management Target Groups” on page I-141
- “How to Configure a Target Group” on page I-142
- “How to Configure Security on the Firewall Manager” on page I-144
- “How to Configure Security on a Target Firewall” on page I-145

How to Add or Change a Group Member

You can use the expanded Members page of the Grouping window to add or change a group member.

To display the expanded Members page of the Grouping window:

1. Select **Configuration** from the Control Panel.
2. Select **Grouping**.
3. Click on the **Members** tab. The Members page appears.
4. Click on **Show Editor**. The expanded Members page appears.

To add a group member:

1. Select a group in the **Group** list. The **Member** list displays its members.
2. (Optional) Select the group member that you want the new member to follow. (Skip this step if you want to add a new member at the top of the list.)
3. Select members to add to the selected group from the **Member Choices** list.
4. Click on the left arrow button. The selected members appear in the **Member** list.
5. If your choice does not appear in the **Member Choices** list or you want to enter a member manually, click on **Insert**. A blank line appears in the **Member** list.
6. Type the member name or IP address in the **Member** field.
7. (Optional) Type any comments in the **Comment** field.
8. Click on **Save**.

To change a group member:

1. Select a group in the **Group** list. The **Member** list displays its members.
2. Select the group member that you want to change.
3. Edit the fields that you want to change.
4. Click on **Save**.

To delete a group member:

1. Select a group in the **Group** list. The **Member** list displays its members.
1. Select the group members that you want to delete from the group.
2. Click on **Delete**. The selected lines are removed from the list.
3. Click on **Save**.

See also:

- "Central Management" on page I-103
- "Central Management Choices Window" on page I-124
- "Central Management Security" on page I-110
- "How to Add Central Management Target Groups" on page I-141
- "How to Configure a Target Group" on page I-142
- "How to Configure Security on the Firewall Manager" on page I-144
- "How to Configure Security on a Target Firewall" on page I-145

Grouping - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

To establish groups:

1. Define grouping in the **/etc/security/firewall/netguard.group** file.
2. Use the following command to read the **netguard.group** configuration file:

   netguard -g netguard.group

   To use a file other than the default configuration file, use the following command:

   netguard -g *group_config_file*.

See also "Packet-Filtering Command (netguard)" on page II-50.

Grouping Database File (netguard.group)

Define group names and members in the grouping database file, **/etc/security/firewall/netguard.group**.

Format guidelines:

- Group definitions begin with **service_group**, **host_group** or **target_group**
- Group members are separated by white space
- Each group definition ends with **end_group**
- Comments begin with the # character and continue until the end of the line

Format:

```
service_group  group_name
  member
  member
end_group

host_group  group_name
  member
  member
end_group
```

```
target_group  group_name
 member
 member
end_group
```

Fields:

service_group	Identifies the beginning of a new service group.
host_group	Identifies the beginning of a new firewall group. A firewall group may contain host or network names or IP addresses and other group names.
target_group	Identifies the beginning of a new Central Management Target Group. Target Groups can contain host names or IP addresses.
group_name	Unique name of the group that is distinct from host and network names.
member	For service groups, previously defined service groups or a service as allowed in the **netguard.conf** file (for example, **smtp/tcp**, or **4000/udp**, or *type*:*code*/**icmp**). For host or target groups, group name or primary name, alias, or IP address of a host or network.
end_group	Keyword identifying the end of a new group.

Note: The order in which groups are defined in the **netguard.group** file is significant. Because a group may contain another group as a member, you must ensure that a group is defined before it is referenced. For example, if GroupB is a member of GroupA, GroupB must be defined before GroupA.

The following example shows the layout of the **netguard.group** file.

```
# /etc/security/firewall/netguard.group
host_group Finance
  cash
  bills
  money
end_group
target_group Development   # Target CyberGuards
  atlantapro               # production system
  atlantadev               # development machine
  atlantasrc               # source control
  jim                      # test machine
  192.147.55.1
  192.149.0.0/255.255.0.0
end_group
```

Figure II-7. Grouping Configuration File Example

See also “Packet Origins and Destinations” on page II-26.

Chapter 4
Packet-Filtering Rules

The system administrator determines which *services* to allow into or out of the internal network. *Packet-filtering rules* define which *packets* can and cannot pass through the firewall and the specific times during which the rule applies.

CAUTION!

Many known security flaws of the network services provided with the system have been corrected. However, every network capability has a certain security risk that must be evaluated.

Notes:

- The order of packet-filtering rules is significant. When a packet arrives, the network packet-filtering software scans the rules list from top to bottom looking for a rule match, applies the *first* rule that matches the characteristics of the packet received, and ignores subsequent rules. If no rule matches, the packet is denied.
- Several kernel tunable parameters affect TCP and ICMP. See "Networking Tunable Parameters" on page I-335 for details.

Packet-Filtering Rules Window

Use this window to view, add, change, delete, or prioritize packet-filtering rules. The Packet-Filtering Rules window has four notebook pages: Basic, IPSec, Times, and RPC.

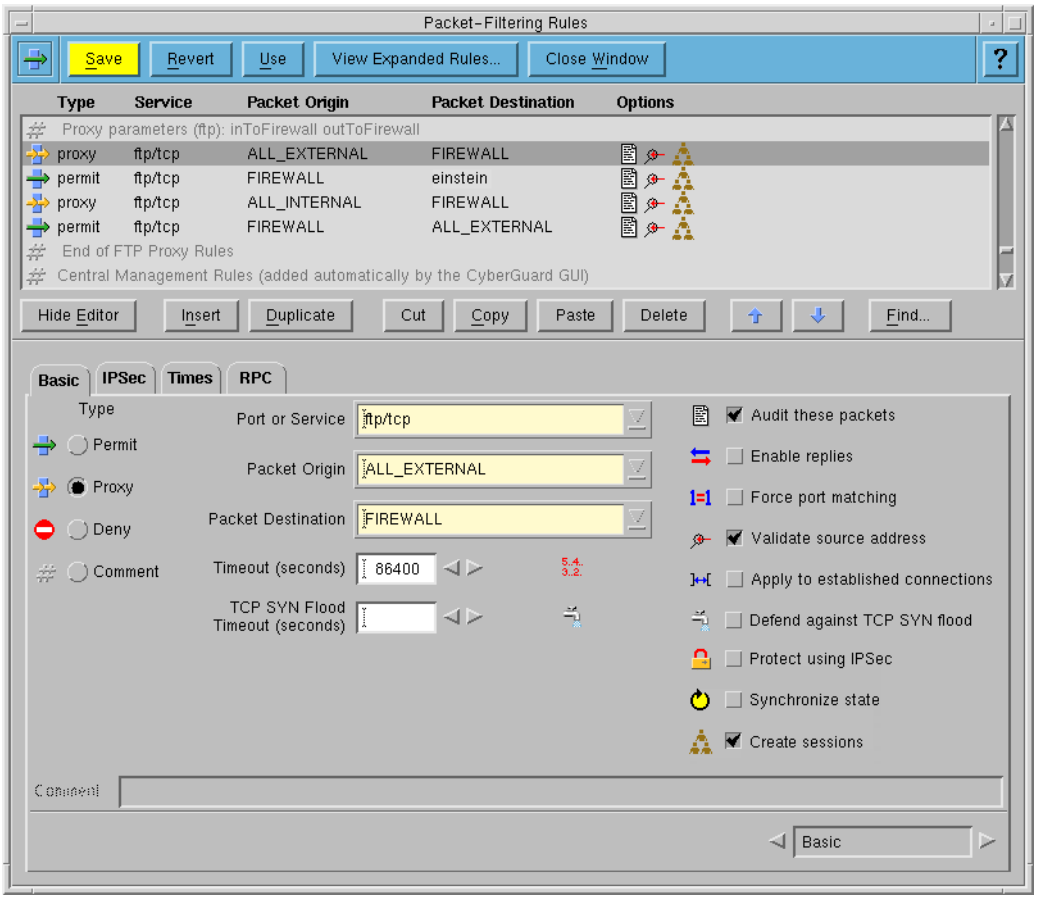


Figure II-8. Packet-Filtering Rules Window - Basic Page (Expanded)

In addition to the buttons described in “Common File Buttons” on page I-14 and “List-Manipulation Buttons” on page I-16, this window contains the **View Expanded Rules** button. The functionality of the **View Expanded Rules** button depends on whether you are managing the firewall or a Target CyberGuard.

If you are managing the firewall and click on this button, a window appears displaying all the rules on the firewall, including the “included” rules such as Central Management rules and Passport One rules. Additional comment lines showing where the included rules begin and end are added to the rules.

If you are managing a Target CyberGuard and click on this button, you are prompted for a host in the target group. Selecting a host causes the firewall to contact the host and download all packet-filtering rules, including known “included” rules. You can open multiple instances of the Expanded Packet-Filtering Rules window (one for the firewall at which

you are sitting and one for each accessible Target CyberGuard) allowing you to view and compare the rules on multiple hosts.

See also:

- "Find Window" on page I-30
- "Groups Page" on page II-11
- "Members Page" on page II-12
- "Passport One Rules Page" on page II-193
- "Central Management" on page I-103
- "Central Management Role Window" on page I-115
- "Central Management Choices Window" on page I-124
- "Target Firewall Configuration Files" on page I-153

Packet-Filtering Rules Basic Page

Use this page of the Packet-Filtering Rules window to add, change, or delete rules.

The expanded version of this window contains the following fields and controls:

Type Has the following settings:

Permit
Packets pass through without intervention. This setting offers the best performance but compromises security. It is usually used with trusted packet transmissions (for example, from the firewall to an internal server).

Proxy
Packets are intercepted and then passed to a proxy that performs specific actions. This setting offers the highest level of security but performance may be reduced. It is usually used with potentially threatening or revealing packet transmissions (for example, from all internal hosts to all external hosts).

Deny
Packets matching this rule are denied or blocked.

Comment
Line is treated as text or a disabled rule; allows typing a comment in the **Comment** field.

Port or Service Port service and optionally the associated protocol. Syntax is *service*[/*protocol*], where:

service - Decimal or hexadecimal port number, port range, service name from the **/etc/inet/services** file, **icmp** services, or the word **ALL**. The format for a port range is *i-j,* where *i* is the lower port number in the range, *j* is the upper port number in the range, and the range is inclusive. A mix of port ranges and individual ports may be entered separated by a comma, for example:

```
20-25, 53, 103-110, 21000-21003
```

Port ranges cannot be used with **icmp**.

protocol - (Required when *service* is a port number or port range or when multiple protocols are possible) Any of the 255 defined decimal or hexadecimal IP protocol numbers or names, including packets constructed using raw IP.

For ICMP type and code filtering, the syntax is *type*:*code*/**icmp**.

Packet Origin Host or network that initiates the connection. For a list of packet origins, see "Packet Origins and Destinations" on page II-26. These predefined packet origins can be used as members of a host group. See "Members Page" on page II-12.

Packet Destination Host or network that receives the connection. For a list of packet destinations, see also "Packet Origins and Destinations" on page II-26. These predefined packet destinations can be used as members of a host group. See "Members Page" on page II-12.

Timeout (seconds) Number of seconds a connection is waiting for a response. When the timeout occurs, the connection is reset and further traffic is not permitted. Responses are expected for TCP connections, and the default timeout is 86,400 seconds (24 hours). Responses are optional for UDP and ICMP connections, and the default timeout is 30 seconds. To use the default settings, set the timeout to 0 or leave the field blank.

TCP SYN Flood Timeout (seconds)
(Optional with **TCP SYN Flood Attack Defense**) Number of seconds to wait for a response to a SYN/ACK before dropping the connection.

Audit these packets (Default) Allows auditing of matches to the rule. Note that this rule state also has an icon (Do not audit these packets) for its disabled state.

Enable replies Allows returning packets through the firewall. The default for UDP is disabled; for connection-oriented TCP, replies are always enabled. If **Type** is set to **Deny**, then a denial response goes to the packet originator.

Force port matching
Forces source and destination ports to be the same.

Validate source address

(Default) Checks source address in a packet against the interface on which the packet arrived. **CAUTION**: If disabled, interface (IP) spoofing can go undetected. **Note:** Any rule pertaining to multicast traffic must have the **Validate source address** option *unchecked* (NO_IF_CHECK option in the **/etc/security/firewall/ng_inet/netguard.conf** file).

Apply to established connections

(*TCP-specific rules only*) Re-establishes TCP connections that time out.

Defend against TCP SYN Flood

Circumvents a TCP SYN flood by handshaking with the client on behalf of the server and then establishing a different connection with the server after the connection attempt has been verified. See also "TCP SYN Flood Defense" on page II-28.

Protect using IPSec Assigns IPSec protection to the rule to establish VPN channels and enables the IPSec page of the Packet-Filtering Rules window. EVERYONE can be specified for the non-tunneled **Packet Origin** or **Packet Destination** of an IPSec packet-filtering rule.

Packet-filtering rules that are automatically added when a proxy is enabled are not automatically protected using IPSec. To protect proxy traffic, this option must be manually selected for each of these proxy rules must be manually selected. See also "Virtual Private Network (VPN)" on page II-235.

Synchronize state In a High Availability configuration, when the served firewall fails over to the standby firewall, in order for the session to continue, the packet-filtering session must be transferred to the new served firewall (former standby). Checking this box allows the sessions resulting from the rule to continue through a failover. This check box appears only for rules that will result in sessions that can safely continue through a failover. The rule must be a permit rule and the service protocol must be tcp or udp with the **Enable replies** option checked. See also "High Availability" on page I-95 and "High Availability Window" on page I-96.

Create Sessions Causes the packet filter to create a session and audit packets that match this rule. By default this box is checked for **Permit** and **Proxy** rules and unchecked for **Deny** rules.

Comment Text or a disabled rule. This field may be blank.

CAUTION!

In the Dynamic page of the Network Address Translation window, changing the setting for **Pass Address** invalidates all existing automatically generated packet-filtering rules for proxies.

Notes:

- Anything that is not specifically allowed is prohibited.
- For outbound packets, **Pass Address** is applied before packet-filtering rules which are applied before Network Address Translation (NAT). For inbound packets, the order is reversed.
- Rules automatically created while configuring routing, SNMP trap alerts, proxies, SOCKS, and Split Domain Name System (DNS) automatically appear in this window. Once you have enabled one of these features, do *not* edit the comments that immediately precede and follow its packet-filtering rules, and do not insert *anything* between them.
- Do not enter the same packet-filtering rule more than once. Edit packet-filtering rules that you copy and paste back into the window.
- For additional packet-filtering options not available through the GUI, see "Packet-Filtering Rules Configuration File (netguard.conf)" on page II-43.
- The firewall can audit several types of packet-filtering rule functions. See "Alerts, Activities, and Archives Window" on page II-326, "Alert Summary Window" on page I-250, and "Activity Reports Window" on page I-252.

See also:

- "Window Components" on page I-10
- "How to Prepare for Secure Remote Management" on page I-159
- "Network Address Translation Window" on page II-66
- "Packet-Filtering Rules for Dynamic Routing" on page II-104
- "Packet-Filtering Rules for Split DNS" on page II-123
- "How to Configure SecurID" on page II-180
- "Virtual Private Network (VPN)" on page II-235
- "Packet-Filtering Rules for Alerts" on page II-340
- "SmartProxies Window" on page III-5
- "Packet-Filtering Rules for SmartProxies" on page III-14
- "Firewall-Generated Packet-Filtering Rules" on page III-16

Packet Origins and Destinations

Packets require a source and destination name or IP address in the **Packet Origin** and **Packet Destination** fields in the expanded Packet-Filtering Rules window.

You can type in any of the following:

- IP address in dotted-quad address format
- Network IP address, /, and sub-network mask in dotted quad or bit-count format (e.g., `mynet/255.255.255.0` or `mynet/24`)
- Host or network name (from Host Name or Network Name window)

Note: IP addresses are preferred over host names for packet-filtering information because they do not depend on the Split Domain Name System (DNS).

You also can select any of the following settings from the drop-down lists:

ALL_INTERNAL	Any host on a network connected to any internal network interface.
ALL_EXTERNAL	Any host on a network connected to any external network interface.
*device*_**NETWORK**	Any host on the network connected to the network interface with the name *device*.
FIREWALL	All traffic to and from the IP address of any interface of the firewall. (This keyword was named LOCAL_HOST and sometimes referred to as BASTION_HOST in previous releases of the firewall. These keywords are no longer used.)
EVERYONE	Firewall and all hosts on either side. Can be used in an IPSec rule, but cannot be configured to be protected by IPSec (cannot represent the tunneled part of the network packet flow from the firewall).
groups	Group name defined in the Grouping window.

The following values are not available in the drop-down list, but some automatically generated packet-filtering rules may use them:

INTERNAL_INTERFACES Any internal network interface.

EXTERNAL_INTERFACES Any external network interface.

Note: The predefined packet origins and destinations listed above can be used as members of a host group. See “Members Page” on page II-12.

See also:

- “Host Names Window” on page II-1
- “Network Names Window” on page II-5
- “Grouping Window” on page II-10
- “How to Add or Change a Packet-Filtering Rule” on page II-37
- “Packet-Filtering Rules Configuration File (netguard.conf)” on page II-43

TCP SYN Flood Defense

The TCP SYN-flood attack is a denial-of-service attack that exploits the TCP connection establishment protocol.

The attacker makes connection requests to the victim host using a fake source address. The requests are made on the TCP port that the victim host's server process is listening on. The connection requests cause TCP SYN segments with the fake source address to be sent to the victim. For each SYN segment received, the victim sends a SYN/ACK segment, and the connection attempt enters the SYN_RCVD state. The connection is put in the connection request queue (backlog) until the final ACK is received to complete the TCP handshake.

The timeout value used by TCP to wait for the final ACK is rather long (usually about 75 seconds) to allow connections to be established over slow links. Because the SYN/ACK segment was sent to a fake host, the connection attempt stays in the backlog until it times out. The backlog is usually quite small; therefore, the backlog for a port can be flooded by a small number of SYNs, and TCP will refuse further connections on that port. Because this attack does not flood a system with continuous connections or volumes of data, the attack is not easy to recognize. The firewall as well as all internal hosts are vulnerable to this attack.

If you enable the **Defend against TCP SYN flood** check box, the CyberGuard Firewall circumvents these attacks as follows:

1. A client sends a connection request (SYN segment) to a server (firewall or internal).
2. The firewall intercepts the SYN segment and responds to the client with a SYN/ACK segment.
3. The firewall waits the specified timeout period for the return ACK from the client to complete the TCP handshake. If the firewall does not receive a return ACK, it drops the packet. If the firewall receives a return ACK, it establishes a connection with the requested server and forwards the original connection request.

Notes:

- Auditing is available for this type of attack. See "Alerts, Activities, and Archives Window" on page II-326, "Alert Summary Window" on page I-250, and "Activity Reports Window" on page I-252.
- An alternate, manual method of defending against TCP SYN floods uses network tunable parameters. See "TCP Parameters for TCP SYN Flood Defense" on page I-340.

Packet-Filtering Rules IPSec Page

IPSec is enabled on the Basic page of the Packet-Filtering Rules window with the **Protect using IPSec** option. Use this page of the Packet-Filtering Rules window to configure the protection strategy (IPSec proposal) for the packet data and establish a secure channel to the remote party (i.e., connect to the IPSec peer). This page provide the additional IPSec parameters required to enforce the policy on the selected rule. All of the fields and controls on this page have satisfactory defaults and do not require user intervention to configure.

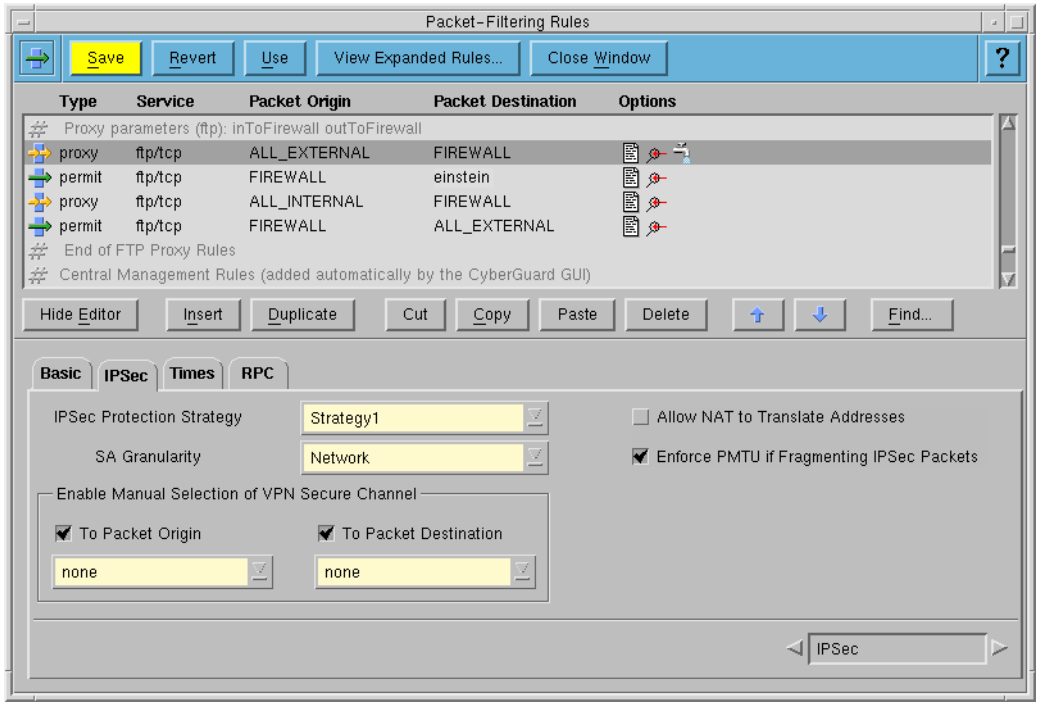


Figure II-9. Packet-Filtering Rules Window - IPSec Page

This window contains the following fields and controls:

IPSec Protection Strategy

User-defined list of names for sets of negotiable SA (Security Association) parameters for the selected rule. These strategies must be previously defined using the IPSec Protection Strategies window. In the IPSec Protection Strategies window, the Firewall Administrator defines a name for the IPSec Protection Strategy. Then, using the Cryptographic Properties page, the Firewall Administrator defines a list of parameter groupings. The list may contain one grouping or multiple groupings. The list represents a priority-ordered set of IPSec parameters. The first grouping in the list has highest priority. During the negotiation process, the IPSec Protection Strategy is negotiated between the firewall VPN and its peer. For the negotiation to be successful, one of the groupings listed in the IPSec Protection Strategy will be agreed upon as the parameters to be used. The successful negotiation of an IPSec Protection Strategy results in an IPSec SA between the firewall VPN and the peer.

The default value for this field is **Default** (case-sensitive). If manual keying is selected for the IPSec peer, only one set of cryptographic properties are used.

SA Granularity

Provides control over how SAs are established with the IPSec peer. The IPSec SA that is established can govern a range of network traffic. This range is called the *granularity* of the SA, and can have one of the following values: **Port**, **Protocol**, **Host**, or **Network**. More network traffic can be governed by a larger, more general, SA Granularity. For example, an SA with Network granularity can govern all traffic between the peer and a network, whereas an SA with Host granularity can govern only the traffic between the peer and a specific host. In general, the greater the granularity of the SA, the fewer IPSec negotiations that are needed to establish other SAs. So unless there are specific security considerations, the largest granularity should be selected.The default is Network, which means to create one SA per network. All matching connections are packed into the same SA.

Port - Creates one SA per port.
Protocol - Creates one SA per protocol.
Host - Creates one SA per host.
Network - Creates one SA per network. Network is the default.

To enable protocol and port selector matching for IPSec rules, the user must select the appropriate SA granularity.

Only the UPD and TCP protocols support service port selectors for IPSec rules. For example, IPSec rules can not differentiate based on ICMP types, only the ICMP IP protocol.

The packet filter dynamically establishes sessions for FTP data flow by watching the associated FTP control flow. The IPSec policy manager is not capable of doing this. Therefore, FTP rules are written as if the **Protocol** granularity were selected. A warning message is displayed if **Port** granularity is configured for FTP.

Enable Manual Selection of VPN Secure Channel

The manual selection of VPN secure channels is disabled by default. This causes the firewall VPN to automatically attempt to identify the secure channel that governs the traffic defined in the packet filtering rule. The firewall uses the information in the **Packet Origin** and **Packet Destination** fields of the packet filtering rule (on the Basic page of the Packet-Filtering Rules window), along with the peer-protected Remote Network information defined for the Secure Channels (on the Peer Protected Networks Page of the VPN Secure Channels window), in attempting to identify the secure channel that governs the traffic defined in the packet-filtering rule.

If desired, the firewall administrator can manually select a previously defined Secure Channel for the Packet Origin and/or for the Packet Destination. This control should be used if the packet origin and/or the packet destination specified in the packet filtering rule are insufficient to identify an IPSec peer (for example, no peer-protected networks have been defined), or the peer that the firewall VPN would choose automatically is not the one the administrator wants.

Another possibility when manually selecting the secure channel is the value **none**. This can be used for specific situations where the firewall administrator wants to override the default behavior. If both the source and destination addresses belong to

IPSec peers, two tunnels exist. If a tunnel-to-tunnel type connection is the default behavior, but the firewall administrator does not want a VPN tunnel to be used but would rather force a connection to a specific host in one of the protected networks, **none** should be used.

Note that IPSec source and destination addresses are not subject to normal routing. Packets for a tunnel are sent to the VPN peer of the selected secure channel.

To Packet Origin - Refers to a secure **Channel Name** defined in the VPN Secure Channels window. If the check box is not checked, the origin is **auto**. A value of **none** can also be selected.

To Packet Destination - Refers to a secure **Channel Name** defined in the VPN Secure Channels window. If the check box is not checked, the destination is **auto**. A value of **none** can also be selected.

Allow NAT to Translate Addresses

Indicates that Network Address Translation (NAT) will translate addresses for this rule. If this option is enabled, NAT will be applied to network traffic matching this packet-filtering rule before it is sent through the tunnel (encapsulated) for outbound traffic, and after it exits the tunnel for inbound traffic. This option is disabled by default. When disabled, the IP addresses of packets are assumed to be private, and no NAT is performed, even if NAT is enabled in the Network Address Translation window.

Note that NAT translation will occur only if the packet crosses a firewall network interface that has dynamic or static NAT enabled. If NAT is not configured, this check box has no effect on the packets.

If any IPSec rules on the IPSec page of the Packet-Filtering Rules window have **Allow NAT to Translate Addresses** checked, the network should be reinitialized. See “System Shutdown Window” on page I-35 and “Network Address Translation” on page II-63 for more information.

There are potential conflicts if the user selects **Allow NAT to Translate Addresses** and the firewall becomes the identity for all rules to which dynamic NAT is applied. For example:

Assume A and B are behind the firewall, the interface X is NATed, and Allow NAT is enabled (0x03), the following rules would create a conflict:

```
permit all/tcp A X ipsec=DesMd5:sa-per-proto:0x03:auto:auto
permit all/tcp B X ipsec=3DesSha1:sa-per-proto:0x03:auto:auto
```

The above rules are interpreted by IPSec as follows:

```
permit all/tcp FW X ipsec=DesMd5:sa-per-proto:0x03:auto:auto
permit all/tcp FW X ipsec=3DesSha1:sa-per-proto:0x03:auto:auto
```

The conflict occurs because the first IPSec strategy (DesMd5) takes precedence over the second IPSec strategy (3desSha1).

Note that NAT pools cannot be used in conjunction with VPN NAT-Smart. NAT-Smart is the ability to choose between bypassing the firewall’s Network Address

Translation (NAT) or allowing NAT to Translate the internal (local) address of an IPSec connection. If the IPSec packet-filtering rule is set to **Allow NAT to Translate Addresses**, the VPN policy must be written using the would-be translated address. Because IKE peers negotiate the policy (addresses) well before an actual connection is made, the translated address must be static (i.e., predictable). With NAT pools, the translated address cannot be predicted in advance.

Enforce PMTU if Fragmenting IPSec Packets

PMTU, *Path Maximum Transmission Unit*, is a technique to determine the largest physical packet size (MTU), measured in bytes, for the entire path that the packets will traverse between the source and the destination. Any messages larger than the MTU are divided into smaller packets (fragmented) before being sent, which slows down transmission speeds. Checking this box prevents IPSec packets from being fragmented. The default setting is checked.

Notes:

- In a VPN tunnel, when going **outbound through** the firewall using a Smart-Proxy, two packet-filtering rules must be configured instead of one:

```
proxy   proxy   external   internal  ipsec=options
permit  proxy   firewall   external  ipsec=options
```

- The firewall will attempt to assist the user by detecting and advising unenforceable policy, but it may not be able to do so in some cases. For instance, the policy parse does not detect lower-precedence rules with a more specific set of selectors:

```
permit ALL    10.1.1.0/24    10.2.2.0/24 \
       ipsec=DesMd5:sa-per-net:0x2:auto:FooGW
permit smtp/tcp  10.1.1.1      10.2.2.2 \
       ipsec=3desSha1:sa-per-port:0x2:auto:BarGW
```

- In general, the rules should be written such that the more specific rules have the higher precedence, above the more general rules:

```
permit smtp/tcp   10.1.1.1      10.2.2.2 \
       ipsec=3desSha1:sa-per-port:0x2:auto:BarGW
permit ALL        10.1.1.0/24   10.2.2.0/24 \
       ipsec=DesMd5:sa-per-net:0x2:auto:FooGW
```

IPSec-Protected Rules, Packet Origins and Destinations

- For *device*_NETWORK to be a tunneled origin or destination, the origin or destination IP address of the target packet must have been routed through the *device* interface.
- If ALL_INTERNAL or ALL_EXTERNAL are used and they represent more than one *device*_NETWORK, the channel cannot be manually selected. Therefore, a default channel for each *device*_NETWORK must be configured by adding the *device*_NETWORK specification to the Peer Protected Networks of the appropriate VPN Secure Channel.
- The following rules apply to using a *device*_NETWORK as a Peer Protected Network:
  - The route to the remote gateway is through the *device* interface, or the host-type channel interface matches the *device* interface
  - Only one channel may use a particular *device*_NETWORK
- The automatic channel selection algorithm (virtual route) attempts to match an IPSec packet-filtering rule origin or destination address with the most specific Peer Protected Network definition. Configured *device*_NETWORK objects are matched only if no match is found within all peer protected host addresses, subnetwork addresses, and address ranges.
- Use host granularity on *device*_NETWORK rules if peer gateway rules are not as general (for example, rules that define specific subnetworks, hosts, etc.). Without a host granularity, *device*_NETWORK rules cause IKE to negotiate using a Phase 2 identity of `0.0.0.0/0` (any address), and this will only match a similar definition on the other side.
- EVERYONE may be used on a rule that uses IPSec, but only if the matching packet address is not coming from or going to an IPSec tunnel.

To determine if a netguard session was tunneled:

- For a snapshot view, use the **netguard -ln** command to see which static rules and dynamic sessions have IPSEC information such as ipsec_src, ipsec_dst, and/or ipsec_nat associated with them.
- Run the following command to cause an audit record to be generated when a new packet-filtering rule is created:

  ```
  auditset -S+ng_add_rule
  ```

  (The **auditset** command must be run prior to network traffic passing through the firewall in order to generate the audit records for **ng_add_rule**. This command can also be added to the **/etc/rc2.d/S03auditlogd** file.)

  The audit record can be seen using the following command:

  ```
  auditrpt -n ng_add_rule
  ```

  The audit record for **ng_add_rule** will contain one or more of the following:

`src ipsec` - if IPSec is enabled to the source for this rule
`dst ipsec` - if IPSec is enabled to the destination for this rule
`nat` - if **Allow NAT to Translate Addresses** is checked for this rule

If the verbose option of the auditrpt command is used as follows:

```
auditrpt -V
```

the **ng_add_rule** audit information is as follows:

```
Enable IPSEC to src TRUE|FALSE
Enable IPSEC to dst TRUE|FALSE
NAT VPN traffic TRUE|FALSE
```

The audit record for the **ng_add_rule** events contains a rule ID that consists of the date, time, and a sequence number. This same rule ID is part of the audit record for the corresponding **ng_end_session** event. Knowing the rule ID, the **ng_add_rule** and **ng_end_session** pair can be identified. This also identifies the time range that this rule was active. Actual traffic passing through the firewall because of this rule is not explicitly marked with the rule ID.

To identify such traffic, look at corresponding traffic (**ng_permit**, **ng_deny**), match type of traffic (telnet, ftp, etc.) by the corresponding port number (as defined in the **/etc/services** file), match source and destination addresses. If this traffic matches a **ng_add_rule** audit record that indicates VPN was enabled, then this traffic was protected by VPN.

See also:

- "Network Address Translation" on page II-63
- "Virtual Private Network (VPN)" on page II-235
- "VPN Secure Channels Window" on page II-264
- "VPN Secure Channels - Peer Protected Networks Page" on page II-272
- "IPSec Protection Strategies Window" on page II-259

Packet-Filtering Rules Times Page

Use the Times page of the Packet-Filtering Rules window to specify times for which a packet-filtering rule applies. This page provides a graphical way to configure active rule times in half-hour increments, as well as input fields to configure these times in one-minute increments.

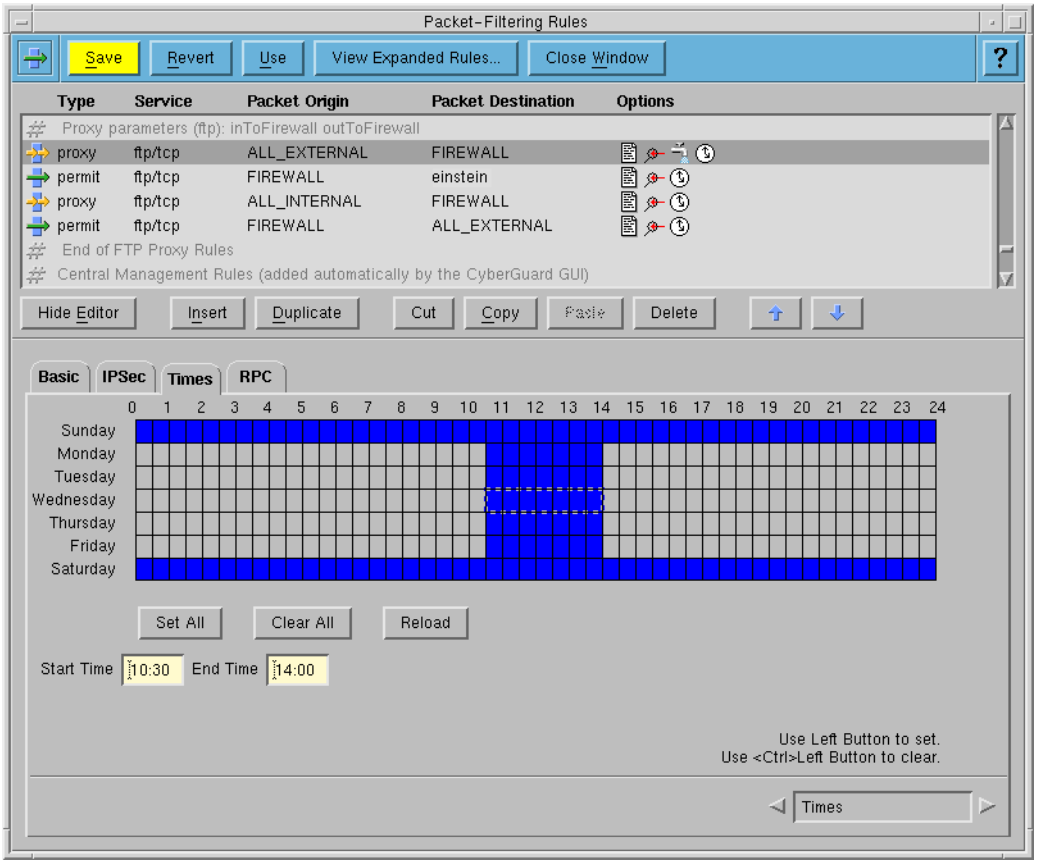


Figure II-10. Packet-Filtering Rules Window - Times Page

This window contains the following fields and controls:

Matrix of Days and Times

The matrix of days and times displays the days of the week and the hours of the day (in half-hour increments). Each selectable square in the matrix represents a particular half hour time period of a particular day of the week. Use your mouse to select times by clicking on one square or dragging over a group of squares. Selected times appear in blue. Times of less than 30 minutes input through the **Start Time** and **End Time** fields appear in blue-gray.

Set All Activates all times in the matrix.

Clear All Clears the matrix of all entries.

Reload Reloads the last version of the matrix that was either saved or that was displayed before the user selected another rule to edit.

Start time Specifies the time the rule becomes active. This field accepts values in one-minute increments. The appropriate square in the matrix will appear in blue-gray for any time less than 30 minutes.

End time Specifies the time the rule becomes inactive. This field accepts values in one-minute increments. The appropriate square in the matrix will appear in blue-gray for any time less than 30 minutes.

Packet-Filtering Rules RPC Page

Remote Procedure Call (RPC) protocol is a general way for programs to execute functions found on a remote host. Remote services can be imbedded as function calls within an application. The RPC protocol handles data exchange between various systems types and operating systems and handles the data in a standard fashion. The CyberGuard Firewall RPC support uses UDP transport protocol to pass function arguments and results between the client and the server.

Use the RPC page of the Packet-Filtering Rules window to define the RPC strategy for rules on the firewall.

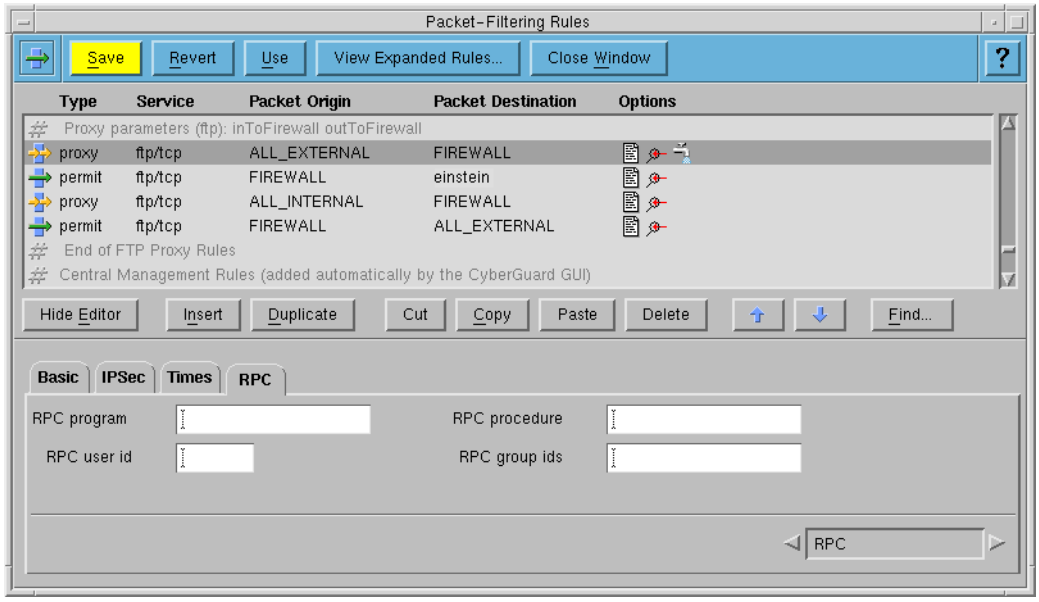


Figure II-11. Packet-Filtering Rules Window - RPC Page

This window contains the following fields:

RPC program Checks the RPC program number or range, buried within a UDP packet. This field accepts the following formats: program name, program number (32-bit number between 0 and 4,294,967,295),

or program number range (two 32-bit numbers, separated with a dash "-").

RPC procedure — Checks the RPC procedure number or range, buried within a UDP packet. This field accepts the following formats: procedure number (32-bit number between 0 and 4,294,967,295) or procedure number range (two 32-bit numbers, separated with a dash "-").

RPC user id — User ID on which to filter. This field accepts a single 16-bit number between 0 and 65535. If an entry exists in the **RPC group id** field, a user ID is required.

RPC group id — This field accepts up to 16 space-separated group IDs. Each group ID is in the form of a 16-bit number between 0 and 65535. If an entry exists in the **RPC user id** field, a group ID is required.

How to Add or Change a Packet-Filtering Rule

You can use the expanded Packet-Filtering Rules window to create a new rule or modify an existing rule.

The order of packet-filtering rules is significant. When a packet arrives, the network packet-filtering software scans the rules list from top to bottom looking for a rule match, applies the *first* rule that matches the characteristics of the packet received, and ignores subsequent rules. If no rule matches, the packet is denied.

CAUTION!

Rules automatically created while configuring routing, SNMP trap alerts, proxies, SOCKS, and Split Domain Name System (DNS) automatically appear in this window. Once you have enabled one of these features, do *not* edit the comments that immediately precede and follow its packet-filtering rules, and do not insert *anything* between them.

Existing automatically generated proxy rules are invalidated when you change the setting for **Pass Address** in the Dynamic page of the Network Address Translation window.

To display the expanded Packet-Filtering Rules window:

1. Select **Configuration** from the Control Panel.
2. Select **Packet-Filtering Rules**. The Packet-Filtering Rules window appears.
3. Click on the **Basic** tab. The Basic page appears.
4. Click on **Show Editor**. The expanded Basic page of the Packet-Filtering Rules window appears.

To add a packet-filtering rule:

1. (Optional) Select the rule that you want the new rule to follow. (Skip this step if you want to add a new rule at the top of the list.)
2. Click on **Insert**. An incomplete new line appears in the list. The **Type** field is set to **Permit**.
3. Select **Permit**, **Proxy**, or **Deny** in the **Type** field.
4. Select the service and protocol to apply the rule to. The selected entry appears in the **Service** field. You also can type in an entry; however, it must be typed correctly. If typed incorrectly, the rule does not find a match and does nothing.
5. Select or type an originating host in the **Packet Origin** field. If known, use the IP address.
6. Select or type a destination host in the **Packet Destination** field. If known, use the IP address.
7. (Optional) Select a value in the **Timeout (seconds)** field for your network connection.
8. Check the **Options** check boxes that apply to this network connection. (To protect from interface spoofing, do not disable **Validate source address**. Use the Alerts page of the Alerts and Activities window to respond to possible interface spoofing attempts.)
9. (Optional) Click on the **Times** tab. The Times page appears.
10. (Optional) Select the desired times from the matrix and fine-tune them with the Start **time** and **End time** fields.
11. Click on **Save**. Your changes take effect at the next system reboot.
12. (Optional) Click on **Use**. Your changes take effect immediately.

To change a packet-filtering rule:

1. Select the rule that you want to change.
2. Edit the fields that you want to change.
3. (Optional) Click on the **Times** tab. The Times page appears.
4. (Optional) Edit the times you want to change.
5. Click on **Save**. Your changes take effect at the next system reboot.
6. (Optional) Click on **Use**. Your changes take effect immediately.

To delete a packet-filtering rule:

1. Select the rule that you want to delete.
2. Click on **Delete**. The rule is deleted.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. (Optional) Click on **Use**. Your changes take effect immediately.

See also:

- “NAT Interfaces Page” on page II-69
- “Alerts Page” on page II-328.
- “SmartProxies Window” on page III-5

How to Prioritize Packet-Filtering Rules

The order of packet-filtering rules is significant. When a packet arrives, the network packet-filtering software scans the rules list from top to bottom looking for a rule match, applies the *first* rule that matches the characteristics of the packet received, and ignores subsequent rules. If no rule matches, the packet is denied.

You can use the Packet-Filtering Rules window to change the order of these rules.

To display the Packet-Filtering Rules window:

1. Select **Configuration** from the Control Panel.
2. Select **Packet-Filtering Rules**. The Packet-Filtering Rules window appears.

To prioritize packet-filtering rules:

1. Select the rule that you want to re-prioritize.
2. Use the arrow buttons to move the rule.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. (Optional) Click on **Use**. Your changes take effect immediately.

Packet-Filtering Rules - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

To configure packet-filtering rules:

1. (Optional) Use the **/etc/security/cyber/trace.conf** file to audit packet-filtering activity.
2. Define services and ports in the **/etc/inet/services** file.
3. Define packet-filtering rules in the **/etc/security/firewall/ng_inet/netguard.conf** file.
4. Run the **/usr/sbin/firewall/netguard** command to apply the rules in the **netguard.conf** file.

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Configuration File (netguard.conf)" on page II-43
- "Packet-Filtering Command (netguard)" on page II-50
- "Activities Configuration File (trace.conf)" on page II-366

Network Services File (services)

Network services are applications, such as **finger**, **telnet**, **FTP**, proxies, and **echo/icmp**, that are run over the network. You can use network services that are defined in the **/etc/inet/services** file, as well as Internet Control Message Protocol (ICMP) services.

Format guidelines:

- Each service is on a separate line
- Fields are separated by white space (spaces or tabs)
- Comments begin with the # character and continue until the end of the line

Format:

name port/protocol [*alias*]

Fields:

name	Service name (Internet name) assigned to the network.
port	Port number (decimal) on which the service is being provided.
protocol	Protocol name (Internet name) that is used for the service.
alias	(Optional) One or more alternate names for the service.

The following examples shows the layout of an **/etc/inet/services** file. Note that this is a subset of the services that are available; refer to the **services** file on your system for a more complete list. These examples shows the important regular and proxy services for the CyberGuard Firewall.

```
# /etc/inet/services
# Regular Services
ftp             21/tcp              # FTP
ssh             22/tcp              # Secure Shell (SSH)
telnet          23/tcp              # Telnet
smtp            25/tcp              # Mail
domain          53/tcp              # Domain Name System
domain          53/udp              # Domain Name System
gopher          70/tcp              # Gopher
gopher          70/udp              # Gopher
http            80/tcp  www-http www# World Wide Web HTTP
nntp            119/tcp             # News
ldap            389/tcp             # LDAP
https           443/tcp             # Secure HTTP (SSL)
ike             500/tcp             # IKE (Internet Key Exchange)
login           513/tcp             # Rlogin
route           520/udp             # network routing
socks           1080/tcp            # SOCKS
notes           1352/tcp            # Lotus Notes
sqlnet          1521/tcp            # SQL*Net can be 1521-1529
radius          1812/udp            # RADIUS Authentication Server
securnetkey     2626/tcp            # SecureNet Key default port
clas-telnet     3023/tcp            # Passport One using telnet
clas-http       3080/tcp            # Passport One using HTTP
clas-https      3443/tcp            # Passport One using HTTPS
securid         5500/udp            # ACE/Server Master (SecurID)
securidprop     5510/udp            # ACE/Server slave (SecurID)
x11-0           6000/tcp            # X Window System
real-audio      7070/tcp            # Real-Audio TCP port
```

Figure II-12. Network Services File Example - Regular Services

```
# /etc/inet/services
# CyberGuard Firewall Proxy Services
pn-raproxy      1090/tcp            # Real-Audio proxy
ms-sql-s        1433/tcp            # MS-SQL server
ms-sql-s        1433/ucp            # MS-SQL server
ms-sql-m        1433/tcp            # MS-SQL monitor
ms-sql-m        1433/ucp            # MS-SQL monitor
x11_hook        5998/tcp            # Telnet with X11 authentication
displayd        5999/tcp            # Launches X11 proxy
ftp-proxy       32789/tcp           # FTP proxy
telnet-proxy    32791/tcp           # Telnet proxy
smtp-proxy      32793/tcp           # SMTP proxy
gopher-proxy    32838/tcp           # Gopher Protocol proxy
http-proxy      32848/tcp           # HTTP proxy
nntp-proxy      32887/tcp           # NNTP proxy
ldap-proxy      33157/tcp           # LDAP proxy
login-proxy     33281/tcp           # Rlogin proxy
notes-proxy     34120/tcp           # Notes proxy
x11_hook-proxy  38766/tcp           # Virtual X11 proxy (Telnet hook)
x11-0-proxy     38768/tcp           # X11 proxy
```

Figure II-13. Network Services File Example - Proxy Services

Internet Control Message Protocol (ICMP) Services

In addition to the services available in the **/etc/inet/services** file, the following Internet Control Message Protocol (ICMP) services can be used:

echo/icmp Tests if a destination is alive and reachable.

echoreply/icmp Response that the destination is alive and reachable.

ireq/icmp Sent from machines to obtain their IP addresses from the network.

ireqreply/icmp Response to **ireq/icmp** message.

mask/icmp Sent from machines to obtain their sub-network masks from the network.

maskreply/icmp Response to **mask/icmp** message.

redirect/icmp Sent to a host to indicate a better route for the datagram. Using this service is NOT recommended from a security standpoint.

sourcequench/icmp Sent to tell the transmitting host to decrease the rate of packet transmission because datagrams are arriving too quickly for a gateway or host to process.

timxceed/icmp Sent to the transmitting host to indicate that the time-to-live counter has reached zero and the packet has been discarded.

unreach/icmp Indicates that an IP message could not be delivered. Reasons include: the network, host, protocol, or port was unreachable; the packet needed to be fragmented; the source route request failed.

Packet-Filtering Rules Configuration File (netguard.conf)

Packet-filtering rules determine which services are allowed through the firewall. Packet-filtering rules are either static or dynamic. A *static rule* is specified in a configuration file such as the default file, **/etc/security/firewall/ng_inet/netguard.conf**. A *dynamic rule* is created for each inbound or outbound packet by comparing the packet header against the kernel rules. Whether a packet transmission is permitted or denied, the dynamic rule remains until its time-to-live expires.

When a packet arrives, the rules in the configuration file are scanned top to bottom seeking a match. The *first* rule that matches the characteristics of the packet is applied, and subsequent rules are ignored.

Notes:

- For outbound packets, packet-filtering rules are applied before Network Address Translation (NAT). For inbound packets, NAT is applied first.
- **Anything that is not specifically allowed is prohibited.**

Format guidelines:

- Each rule is on a separate line
- Fields are separated by white space (spaces or tabs)
- Fields are case-insensitive
- Comments begin with the # character and continue until the end of the line

Format:

rule_type service source destination options

Fields:

rule_type
Type of packet-filtering rule. One of the following must be used:

permit
A *permit rule* allows packets to pass through the firewall. Permit rules offer the best performance but could compromise security. A permit rule is usually used with trusted packet transmissions, such as transmissions from the firewall to an internal server.

proxy
A *proxy rule* causes packets to be intercepted and passed to a proxy that will enforce

additional rules. A proxy rule provides the highest level of security. Proxy rules are usually used with potentially threatening or revealing packet transmissions, such as transmissions from all internal hosts to all external hosts.

Proxy rules on outbound requests provide extra control and auditing capabilities. Proxy rules on inbound requests allow the use of unregistered internal addresses in addition to extra control and auditing capabilities.

deny
A *deny rule* denies or blocks packets that match the rule.

service
Network service to permit, deny, or proxy. One of the following must be used:

- Valid service from the **/etc/inet/services** file. If the service is duplicated between UDP and TCP, the protocol must be explicitly stated.
- Valid *service*/*protocol* to define a *port*/*protocol* pair.
- *port*/*protocol* pair.
- *port_range*/*protocol* pair. Port ranges can be used for TCP and UDP, but not ICMP. Specify port ranges as *low_integer*-*high_integer*.
- *icmp_type*/**icmp** pair.
- **ALL**, to specify all services.
- **ALL**/*protocol*, to define a protocol.

Note: A leading = (equal sign) indicates that the source port's range is restricted to be the same as that of the destination port. Otherwise, the source port can be any port. (This corresponds to the **Force port matching** option on the expanded Packet-Filtering Rules window.)

source and destination
Source is the host or network that sends the packets; *destination* is the host or network that receives the packets. One of the following variable or keywords must be used:

- Host name from the **/etc/inet/hosts** file.
- IP address specified in "dot" notation format.
- Network name listed in the **/etc/inet/networks** file.
- *network*/*subnetmask* from the **/etc/inet/networks** file.
- **EVERYONE**, to specify the firewall and all hosts on either side.
- **ALL_INTERNAL**, to refer to all traffic to and from a network that is connected to an interface that is defined as **internal** in the **/etc/confnet.d/inet/interface** file.
- **INTERNAL_INTERFACES**, to refer to all traffic to and from the IP address of any interface that is defined as **internal** in the **/etc/confnet.d/inet/interface** file.

- **ALL_EXTERNAL**, to refer to all traffic to and from a network connected to an interface that is *not* defined as the **loopback** interface and *not* defined as **internal** in the **/etc/confnet.d/inet/interface** file.
- **EXTERNAL_INTERFACES**, to refer to all traffic to and from the IP address of any interface that is *not* defined as the **loopback** interface and *not* defined as **internal** in the **/etc/confnet.d/inet/interface** file.
- *interface*_**NETWORK**, to refer to any host on the network connected to *interface*.
- *interface*_**IPADDRESS**, to refer to the actual IP address of *interface*.
- **FIREWALL**, to refer to all traffic to and from the IP address of any interface of the firewall. This keyword was named LOCAL_HOST in prior releases of the firewall.
- *type*:*code*/**icmp**, valid for *destination* only, implements packet-filtering on ICMP type and code.

Note: A leading = (equal sign) or using one of the interfaces on the firewall with the *interface*_**IPADDRESS** keyword indicates that the kernel rule will not be modified to reflect that all firewall interface addresses are valid.

options

One or more of the following keywords can be used:

CLONE_REAL_AUDIO
This session emulates the characteristics of a RealAudio session.

CLONE_TFTP
This session emulates the characteristics of a TFTP session.

DONT_AUDIT
Specifies that matches to this filtering rule should not be audited. The default is to audit matches to a rule.

ENABLE_REPLY
Allows returning packets through the firewall. Replies to UDP packets are disabled by default; Replies to connection-oriented TCP packets are always enabled. If the packet matches a deny rule, a denial response is sent to the packet originator.

ESTABLISHED
Re-establishes TCP connections that time out.

ipsec=*ipsec_protection_strategy*:*sa_granularity*:*nat_pmtu_flag*:*origin_channel*:*destination_channel*

User-defined list of negotiable SA parameters, defined as the IPSec Protection Strategy, for the rule. By default, the default list is used. If manual keying is selected for the IPSec channel, the cryptographic algorithms specified in the first proposal in the list are used.

ipsec_protection_strategy - User-defined name of the IPSec Protection Strategy.

sa_granularity - Provides control over how SAs are established with the IPSec

channel. The options are **sa-per-net** (create one SA per network), **sa-per-port** (create one SA per port), **sa-per-protocol** (create one SA per protocol), and **sa-per-host** (create one SA per host). All matching connections are packed into the same SA.

nat_pmtu_flag - If the Network Address Translation (NAT) flag is turned on, the firewall will translate addresses for this rule. NAT is applied to the packet before it enters the tunnel. By default, NAT is turned off. If the PMTU flag is turned on, IPSec packets are prevented from being fragmented. By default, PMTU is turned on.

0x1 - Indicates that **Allow NAT to Translate Addresses** is checked on the IPSec page of the Packet-Filtering Rules window, and **Enforce PMTU if Fragmenting Packets** is not checked

0x2 - Indicates that **Allow NAT to Translate Addresses** is not checked, and **Enforce PMTU if Fragmenting Packets** is checked

0x3 Indicates that both **Allow NAT to Translate Addresses** and **Enforce PMTU if Fragmenting Packets** are checked.

The default is 0x2.

origin_channel - Name of the IPSec channel configuration used to tunnel to the address specified in the packet origin in the packet-filtering rule. This is a manual override of the automatic channel selection, AUTO, which is the default. This field can also be NONE.

destination_channel - Name of the IPSec channel configuration used to tunnel to the address specified in the packet destination in the packet-filtering rule. This is a manual override of the automatic channel selection, AUTO, which is the default. This field can also be NONE.

By default, IPSec channel determination is automatic. If not specified, the peer-protected networks configured in the Peer Protected Networks Page of the VPN Secure Channels window are used to identify the channel. Manual selection of IPSec channels is enabled when the packet origin or destination is not enough to identify an IPSec channel (for example, no peer-protected networks have been defined), or the channel that would be chosen is not the one the administrator wants to use. There is also a tunnel-to-tunnel scenario where the administrator might want to choose **none** for one of the channels.

NO_IF_CHECK
Does not check if the source addresses of an inbound packet matches the interface it came over. **CAUTION**: This option can cause interface spoofing to go undetected. **Note:** Any rule pertaining to multicast traffic must have the NO_IF_CHECK option associated with it.

TCPSYNFLD
Applies the TCP SYN-flood defense strategy.

TCPSYNFLD_TIMEOUT=*seconds*

Amount of time the SYN-flood defense strategy should wait for a response to a SYN/ACK. The default is the value of the **NG_TCPSYNFLD_TIMEOUT** tunable. Valid only with the **TCPSYNFLD** keyword.

TIME_OUT=*seconds*
Number of seconds a connection waits for a response. If a timeout occurs, the connection is reset and further traffic is prohibited. Responses are expected for TCP connections (default timeout is 24 hours); responses are optional for UDP/ICMP connections (default timeout is 30 seconds). To use the default settings, set the timeout to 0 or do not use this option.

RPC_PROC=*procedure_number*
Checks the RPC procedure number or range, buried within a UDP packet.

RPC_PROGRAM=*program_number*
Checks the RPC program number or range, buried within a UDP packet.

RPC_USER=*uid*:*gid*,*gid*...
This *uid* (user ID) and primary *gid* (group ID) along with the secondary *gid*s must be a superset of the *uid* and *gid*s within the RPC packet. If a *gid* in the RPC packet is not within this definition, the packet will not match.

tbr=*times*
Colon, dash, and comma separated list specifying the times that the rule is active. Colons separate days from time, dashes denote a time range, and commas separate time ranges within the same day. Times are formatted using a 24-hour clock and days are formatted as 0 for Sunday through +6 for Saturday. The following rule represents Sunday from 10 a.m through 12:35 a.m., Sunday from 3:00 p.m. through 11:15 p.m., Wednesday from 7 a.m. through 8 p.m., and Saturday from 12:00 pm through 5:00 p.m.

```
tbr=0:1000-1235,1500-2315+3:0700-2000+6:1200-1700
```

FAILOVER
In a High Availability configuration, when the served firewall fails over to the standby firewall, in order for the session to continue, the packet-filtering session must be transferred to the new served firewall (former standby). This option allows the sessions resulting from the rule to continue through a failover. This option can be applied only to permit rules with tcp protocol or udp protocol with ENABLE_REPLY set, and no given protocol (like ALL for a service). See also “High Availability” on page I-95 and “High Availability Window” on page I-96.

no_session
Causes the packet filter not to create a session and not to audit packets that match this rule. This option should always be used with **Deny** rules.

The following example shows the format of the **netguard.conf** file.

```
# /etc/security/firewall/ng_inet/netguard.conf
# Inbound traffic
permit  nntp/tcp        world_news      local_internal_news
permit  who/udp         EVERYONE        FIREWALL      DONT_AUDIT
permit  route/udp       EVERYONE        FIREWALL      DONT_AUDIT
proxy   telnet/tcp      ALL_EXTERNAL    EVERYONE
# Outbound traffic
permit  nntp/tcp        local_internal_news    world_news
permit  finger/tcp      FIREWALL      EVERYONE
permit  echo/udp        FIREWALL      EVERYONE        ENABLE_REPLY
# All other traffic
permit  telnet/tcp      ALL_INTERNAL    EVERYONE
permit  login/tcp       ALL_INTERNAL    EVERYONE
permit  ftp/tcp         ALL_INTERNAL    ALL_EXTERNAL
deny    all             EVERYONE        EVERYONE
```

Figure II-14. Packet-Filtering Rules File Example

Examples of packet-filtering rules are provided in the following sections:

- “Routing - Underlying Constructs” on page II-109
- “Packet-Filtering Rules for Split DNS” on page II-123
- “How to Configure SecurID” on page II-180
- “Alerts Configuration File (alert.conf)” on page II-362
- “How to Prepare for Secure Remote Management” on page I-159
- “Packet-Filtering Rules for SmartProxies” on page III-14
- “FTP Proxy - Packet-Filtering Rules” on page III-31
- “Gopher Proxy - Packet-Filtering Rules” on page III-48
- “HTTP Proxy - Packet-Filtering Rules” on page III-88
- “LDAP Proxy - Packet-Filtering Rules” on page III-118
- “Load Equalizer Proxy - Packet-Filtering Rules” on page III-129
- “NNTP Proxy - Packet-Filtering Rules” on page III-148
- “Notes Proxy - Packet-Filtering Rules” on page III-157
- “Port Guard Proxy - Packet-Filtering Rules” on page III-164
- “RealAudio Proxy - Packet-Filtering Rules” on page III-177
- “Remote Login Proxy - Packet-Filtering Rules” on page III-181
- “SMTP Proxy - Packet-Filtering Rules” on page III-209
- “SQL*Net Proxy - Packet-Filtering Rules” on page III-230
- “SSL Protocol Proxy - Packet-Filtering Rules” on page III-241
- “Telnet Proxy - Packet-Filtering Rules” on page III-253
- “X11 Proxy - Packet-Filtering Rules” on page III-273

Packet-Filtering Rules for SNMP

CAUTION!

Running an SNMP agent on the firewall is not recommended from a security standpoint; however, it is possible. If you run an SNMP agent on the firewall, permit SNMP traffic only from an SNMP management station on the internal network to the firewall for SNMP queries, and permit SNMP traffic only from the firewall to the SNMP management station on the internal network for SNMP responses. The same rules for SNMP traps apply. Never allow SNMP traps, queries, or responses to go to the external network.

The Simple Network Management Protocol (SNMP) provides a means for system and network administrators to efficiently manage, monitor, and maintain local or remote TCP/IP-based computer networks. An administrator can collect performance statistics, trouble shoot, or enable/disable network interfaces from a central location on any computer system running SNMP on the network. The SNMP manager (client) process sends requests to an SNMP agent (server) which responds to these requests. The SNMP agent communicates with SNMP management stations (clients) over predefined ports.

Limit access to the SNMP agent by adding packet-filtering rules similar to the following in the **netguard.conf** file. Access should be limited to internal hosts.

```
# /etc/security/firewall/ng_inet/netguard.conf
# SNMP rules
permit  snmp/udp        management_station  FIREWALL   ENABLE_REPLY
permit  snmp-trap/udp   management_station  FIREWALL   ENABLE_REPLY
deny    snmp/udp        ALL_EXTERNAL        FIREWALL   ENABLE_REPLY
deny    snmp-trap/udp   ALL_EXTERNAL        FIREWALL   ENABLE_REPLY
```

Figure II-15. Packet-Filtering Rules for the SNMP Agent

Note: Adding support for SNMP does not mean that it will be possible to remotely configure CyberGuard Firewall-specific features across the network.

See also:

- SNMP in the *Network Administration* UnixWare online manual
- “Alerts Configuration File (alert.conf)” on page II-362

Packet-Filtering Command (netguard)

Invoke the **/usr/sbin/firewall/netguard** command without options to apply the packet-filtering rules that you defined in the **netguard.conf** file. The **netguard** command also has options that allow you to view and modify the kernel rules and perform other firewall administration tasks.

Syntax:

/usr/sbin/firewall/netguard
/usr/sbin/firewall/netguard -a[**k** *keys*] [**n**]
/usr/sbin/firewall/netguard -A[**n**]
/usr/sbin/firewall/netguard -c
/usr/sbin/firewall/netguard -d[**nw**]
/usr/sbin/firewall/netguard -f[**w**] *config_file*
/usr/sbin/firewall/netguard -h
/usr/sbin/firewall/netguard -H
/usr/sbin/firewall/netguard -I
/usr/sbin/firewall/netguard -l[**k** *keys*][**nw**]
/usr/sbin/firewall/netguard -L[**nw**]
/usr/sbin/firewall/netguard -p[**wd**]
/usr/sbin/firewall/netguard -p[**wd**] [**-f** *config_file*]
/usr/sbin/firewall/netguard -P
/usr/sbin/firewall/netguard -q[**w**]
/usr/sbin/firewall/netguard -r
/usr/sbin/firewall/netguard -s
/usr/sbin/firewall/netguard -S[**n**] **all**
/usr/sbin/firewall/netguard -S[**n**] *interface*
/usr/sbin/firewall/netguard -t[**w**] *host_name*
/usr/sbin/firewall/netguard -v *vpn_config_dir*
/usr/sbin/firewall/netguard -w

Options and arguments:

-a Displays all currently active sessions (permitted, proxied, or denied). Active sessions are displayed in the format described on page II-59.

-A Displays all currently active sessions (permitted, proxied, or denied) and displays the reason for packet denial. Active sessions are displayed in the format described on page II-59; reasons for packet denial are described on page II-60.

-c Clears (resets) kernel statistical data counts displayed by the **-I** option.

-d Displays each static rule as it is represented in the configuration file, followed by its kernel rule. If the **-d** is used without the **-p** option, both the configuration file and the current kernel rules are parsed. The format of static rules is described on page II-56.

-f *config_file*
Uses *config_file* rather than **/etc/security/firewall/ng_inet/netguard.conf**, the default configuration file.

-g *group_config_file*
Use **netguard -g netguard.group** to use the default group configuration file. Use **netguard -g** *group_config_file* to use a file other than the default configuration file.

-h and **-H**
Displays a list of **netguard** options and a brief description of each.

-I Displays internal kernel **netguard** statistics as described on page II-52.

-k *keys*
Sorts output from the **-a** and **-l** options based on the selected key values described on page II-52.

-l Displays each kernel rule to the screen in the format outlined on page II-56.

-L Displays each kernel rule to the screen in the format outlined on page II-56. Additionally, all rules that have associations (for example, ftp control and data) are shown as *linked*.

-n Displays IP addresses rather than host names and displays services as port numbers rather than service names.

-p Parses the configuration file for an invalid format.

-q Queries **netguard** status to determine if **netguard** kernel code has been activated.

-r Removes all kernel rules, causing the firewall to become a bastion host. This option must be used alone.

-s Displays the required format of the configuration file.

-S all
Displays network statistics for all interfaces.

-S *interface*
Displays network statistics for *interface*.

-t *host_name*
Terminates all sessions for *host_name* until the **netguard** command is run again.

-v *vpn_config_dir*
Uses *vpn_config_dir* as the vpnguard configuration directory subtree instead of the default **/etc/security/firewall/vpn/**.

-w Suppresses all warning messages while another **netguard** option is being executed. Warning messages are described on page II-61.

Key Values (netguard -k)

The following values are arguments to the **netguard -k** command and sort output from the **netguard -a** and **netguard -l** commands as follows:

O Original rule's time stamp (not displayed by **-a**)
o Original rule's sequence number (last 4 digits displayed)
R Rule time stamp (displayed as elapsed time)
r Rule sequence number (not displayed)
S IP source address
D IP destination address
s TCP/UDP source port
d TCP/UDP destination port
P Protocol
I Source interface name (not displayed by **-a**)
i Destination interface name (not displayed by **-a**)

For example, **netguard -a -kPSD** sorts by protocol, IP source address, and IP destination address. A dash before a sort key causes that key to be sorted in descending order. For example, **netguard -a -k-R** displays sessions in newest to oldest order.

Kernel Statistics (netguard -I)

The **-I** option displays kernel statistical information relating to **netguard** sessions. This option displays session data types and counts and the source and destination IP addresses of the last session associated with that particular session data count. The kernel session statistics can be cleared (reset) with **netguard -c**. Only non-zero statistical counts are displayed.

The following example shows the format of the output of the **netguard -I** command.

```
$ /usr/sbin/firewall/netguard -I
NETGUARD Statistics           Count  Last Src Address    Last Dest Address
================================================================================
Session: Permit      :          89  192.168.36.2         markz
  tcp  : SYN         :           7  192.168.36.2         markz
  udp  :             :          77  192.168.36.12        192.168.36.255
  icmp : echo        :           5  192.168.36.2         markz
Session: No Match    :           6  192.168.36.19        192.168.6.255
  udp  :             :           6  192.168.36.19        192.168.6.255
TCP Close:           :           6  192.168.36.16        192.168.6.2
  tcp  : FIN>   <FIN :           6  192.168.36.16        192.168.6.2
Dropped Packet:      :         350  192.168.36.47        192.168.6.255
  invalid i/f        :         350  192.168.36.47        192.168.6.255
```

Figure II-16. Kernel Statistics Example (netguard -I)

The following list describes the statistical information that is tracked for each session type:

Proxy Sessions

Session: Proxy:	Total of all proxy sessions.
tcp: SYN:	TCP-based proxy sessions started.
tcp: DUP SYN:	Repeated SYNs to start TCP-based proxy sessions.
udp:	UDP-based proxy sessions started.

Proxy Relay Sessions

Session: PRelay:	Total of all proxy relay sessions.
tcp: SYN:	TCP-based proxy relay sessions started.
tcp: DUP SYN:	Repeated SYNs to start TCP-based proxy relay sessions.
udp:	UDP-based proxy relay sessions started.

Permitted Sessions

Session: Permit:	Total of all permitted sessions.
tcp: SYN:	TCP-based permits started.
tcp: DUP SYN:	Repeated SYNs to start TCP-based permits.
tcp: Established:	Permits started based on ESTABLISHED keyword.
udp:	UDP-based permits started.
rpc:	RPC-based permits started.
icmp: echoreply:	ICMP ECHO REPLY (ping reply) permits started.
icmp: unreach:	ICMP destination UNREACH(able) permits started.
icmp: sourcequench:	ICMP SOURCE QUENCH (flow control) permits started.
icmp: redirect:	ICMP REDIRECT (reroute info) permits started.
icmp: echo:	ICMP ECHO (ping request) permits started.
icmp: timxceed:	ICMP TIME (to live) EXCEEDED permits started.
icmp: paramprob:	ICMP PARAMETER PROBLEM (ex. bad IP hdr) permits started.
icmp: tstamp:	ICMP TIME STAMP request permits started.
icmp: tstampreply:	ICMP TIME STAMP REPLY permits started.
icmp: ireq:	ICMP INFORMATION REQUEST permits started.
icmp: ireqreply:	ICMP INFORMATION REQUEST REPLY permits started.
icmp: mask:	ICMP ADDRESS MASK request permits started.
icmp: maskreply:	ICMP ADDRESS MASK REPLY permits started.
other:	Permits started by other IP protocols.

Denied Sessions

Session: Deny:	Total of all denied sessions.
tcp: SYN:	Denies containing SYN flag header.
tcp: ACK:	Denies containing ACK flag header.
tcp: FIN:	Denies containing FIN flag header.
tcp: RST:	Denies containing RST flag header.
tcp: SYN/ACK:	Denies containing SYN/ACK flag header.
tcp: Other:	Denies containing other header flags.
udp:	UDP-based denies.
icmp: echoreply:	ICMP ECHO REPLY (ping reply) denies.
icmp: unreach:	ICMP destination UNREACH(able) denies.

icmp: sourcequench:	ICMP SOURCE QUENCH (flow control) denies.
icmp: redirect:	ICMP REDIRECT (reroute info) denies.
icmp: echo:	ICMP ECHO (ping request) denies.
icmp: timxceed:	ICMP TIME (to live) EXCEEDED denies.
icmp: paramprob:	ICMP PARAMETER PROBLEM (ex. bad IP hdr) denies.
icmp: tstamp:	ICMP TIME STAMP request denies.
icmp: tstampreply:	ICMP TIME STAMP REPLY denies.
icmp: ireq:	ICMP INFORMATION REQUEST denies.
icmp: ireqreply:	ICMP INFORMATION REQUEST REPLY denies.
icmp: mask:	ICMP ADDRESS MASK request denies.
icmp: maskreply:	ICMP ADDRESS MASK REPLY denies.

No Match Sessions

Session: No Match:	Total of sessions that do not match any rules.
tcp: SYN:	No matches containing SYN flag header.
tcp: ACK:	No matches containing ACK flag header.
tcp: FIN:	No matches containing FIN flag header.
tcp: RST:	No matches containing RST flag header.
tcp: SYN/ACK:	No matches containing SYN/ACK flag header.
tcp: Other:	No matches containing other flags in header.
udp:	UDP-based no matches.
icmp: echoreply:	ICMP ECHO REPLY (ping reply) no matches.
icmp: unreach:	ICMP destination UNREACH(able) no matches.
icmp: sourcequench:	ICMP SOURCE QUENCH (flow control) no matches.
icmp: redirect:	ICMP REDIRECT (reroute info) no matches.
icmp: echo:	ICMP ECHO (ping request) no matches.
icmp: timxceed:	ICMP TIME (to live) EXCEEDED no matches.
icmp: paramprob:	ICMP PARAMETER PROBLEM (ex. bad IP hdr) no matches.
icmp: tstamp:	ICMP TIME STAMP request no matches.
icmp: tstampreply:	ICMP TIME STAMP REPLY no matches.
icmp: ireq:	ICMP INFORMATION REQUEST no matches.
icmp: ireqreply:	ICMP INFORMATION REQUEST REPLY no matches.
icmp: mask:	ICMP ADDRESS MASK request no matches.
icmp: maskreply:	ICMP ADDRESS MASK REPLY no matches.
other:	No matches attempted by other IP protocols.

Closed TCP-Based Sessions

TCP Close:	Total of closed TCP-based sessions.
tcp: SYN>:	Closes in which only a SYN was received. **Note:** A high count value indicates routing problems/down host.
tcp: SYN> <SYN:	Closes when SYN sent and SYN received, but no data. **Note:** A high count value indicates routing problems.
tcp: SYN> <FIN:	Abnormal closes - SYN sent and FIN received.
tcp: SYN> <RST:	Abnormal closes - SYN sent and RST received.
tcp: ACK> <ACK:	Abnormal closes - ACK sent and ACK received.
tcp: ACK> <FIN:	Abnormal closes - ACK sent and FIN received.
tcp: ACK> <RST:	Abnormal closes - ACK sent and RST received.
tcp: FIN> <ACK:	Abnormal closes - FIN sent and ACK received.
tcp: FIN> <FIN:	Normal closes - FIN sent and FIN received.

tcp: FIN> <RST:	Abnormal closes - FIN sent and RST received.
tcp: RST> <ACK:	Abnormal closes - RST sent and ACK received.
tcp: RST> <FIN:	Abnormal closes - RST sent and FIN received.
tcp: RST> <RST:	Abnormal closes - RST sent and RST received.

Sessions that Cause Special Replies

Response Generated:	Total sessions causing special replies.
tcp: RST:	Remote sessions terminated with TCP RST because of deny/no match.
tcp: RST KAlive:	Remote 'keepalive' sessions terminated with TCP RST because of deny/no match.
tcp: RST LoopBk:	Local sessions (loopback) which internally generated packets and were terminated with TCP RST.
icmp: UNREACH:	Sessions causing ICMP Port Unreachable generation.
icmp: REDIRECT:	Sessions causing ICMP 'host redirect' generation.
icmp: TIMXCEED:	Sessions where a routing loop was detected causing ICMP TIME EXCEEDED generation.

Sessions with Dropped Packets

Dropped Packet:	Total sessions involving packet loss.
mget fail:	Kernel message buffer resources unavailable.
short fragment:	Invalid fragment size.
short packet:	Invalid packet size.
invalid fragment:	Fragment overlays protocol header flags.
invalid rpc xid:	RPC XID not recognized.
invalid i/f:	Packet came in over the wrong interface.
no route:	No route to IP address.
route loop:	Routing error on network.
forward deny:	Packet involved in a forwarding attack.

Reflected Sessions

Reflected Sessions:	Total "reflected" sessions.
I/F in == I/F out:	Packet "in" interface same as "out" interface.
rt in == rt out:	Packet "in" route entry same as "out" route entry.

TCP Relay Packets

TCP Relay Packets:	Total of packets through TCP Relay.

TCP SYN Flood Defense Sessions

TCP SYNFlood Defense:	Total of sessions defended from TCP SYN floods.
defense skipped:	Defense not started.
conn established:	TCP connection handshake completed.
conn refused:	Server TCP refused connection.
rule expired:	Netguard rule expired during connection handshake.
timeout: <SYN|ACK:	Source did not respond to SYN/ACK.
timeout: SYN>:	Destination did not respond to SYN.
timeout: <FIN:	Source did not respond to FIN.

source: FIN:	Source sent FIN before handshake with destination complete.
source: RST:	Source sent RST before handshake with destination complete.
source: bad TCP:	Aborted - source sent invalid or unexpected TCP segment.
dest: bad TCP:	Aborted - destination sent invalid or unexpected TCP segment.
alloc failure:	Aborted - allocation failure.

Miscellaneous events during TCP SYN Flood Defense

TCP SYNFlood Misc:	Total of miscellaneous events during TCP SYN flood defense.
source drop:	Invalid or unexpected TCP segment from source dropped.
dest drop:	Invalid or unexpected TCP segment from destination dropped.
RST failure:	Failed to send RST segment.

Kernel Rules Format (netguard -d, netguard -l, netguard -L)

The **-d**, **-l**, and **-L** options display kernel rules as shown in the following example.

```
$ /usr/sbin/firewall/netguard -l
[tcp] proxy -ip dec0 qatest1 1452/tcp dec1 qatest3 telnet/tcp
enable_reply update_time two_way session src_frg_id=52982
dst_frg_id=3613 d_ttl=86400secs ttl=86364secs

[tcp] permit -ip lo0 cyberext1 1070/tcp dec1 qatest3
telnet/tcp enable_reply update_time two_way session src_frg_id=3596
dst_frg_id=3287 d_ttl=86400secs ttl=85051secs

[udp] permit -ip dec1 192.168.6.57 route/udp lo0
192.168.6.0/0xffffff00 route/udp enable_reply update_time two_way
session src_frg_id=15535 dst_frg_id=0 d_ttl=80secs ttl=64secs

[udp] permit -ip dec1 qatest2 who/udp lo0
192.168.6.0/0xffffff00 who/udp enable_reply update_time two_way
session src_frg_id=51625 dst_frg_id=0 d_ttl=240secs ttl=199secs

[udp] permit -ip dec0 qatest1 who/udp lo0
172.16.2.0/0xffffff00 who/udp enable_reply update_time two_way
session src_frg_id=52981 dst_frg_id=0 d_ttl=240secs ttl=136secs
```

Figure II-17. Kernel Rules Format (netguard -l)

Kernel rules format for the -d and -l options (one line):

[bucket] *action protocol source_interface source_address/source_mask* \
source_port/protocol dest_interface dest_address/dest_mask \
dest_port/protocol rule_state

Components of the kernel rules are defined as:

`[bucket]` If displayed, will be one of the following:

`[relay]` - Relay rule bucket
`[static]` - Static rule bucket
`[syn_st]` - TH_SYN state rule bucket
`[proto]` - Specific protocol bucket
`[spstat]` - Special static rule bucket

action Action that each rule can apply: **permit**, **deny**, **proxy**, **prelay**

protocol Protocol suite being used

source_interface
Source interface name

source_address/source_mask
Source IP address and source network mask

source_port/protocol
Source port number and protocol

dest_interface
Destination interface name

dest_address/dest_mask
Destination IP address and destination network mask

dest_port/protocol
Destination port number

rule_state Zero or more flags (listed in the following section) indicating state information associated with a kernel rule

Rule State Flags:

clone_tftp	Rule will act as a tftp rule.
clone_real_audio	Rule will act as a RealAudio rule.
count=*x*	Only applies to static rules and is a count of the sessions that have been created as a result of this rule since the last time the statistics were cleared.
deny_rule	Cause of denial was DENY.
dont_audit	Do not audit matches made to this rule.
drop=*x*	Only applies to static rules and is a count of the number of packets dropped due to the session rate being exceeded.
dst_frg_id= *x*	Last DST IP fragment ID was *x*.
dst_p= *x*	*x* packets have been send from the destination.
d_ttl= *x* **secs**	*x* seconds must pass before a rule can be terminated after receipt of a return packet (default is 30 seconds for non-TCP traffic and 86400 seconds for TCP traffic).
enable_reply	Returning packets will be allowed through when a dynamic kernel rule is built.

established	Established session are allowed.
forward_deny	Cause of denial was FORWARD ERROR.
ftpd_active	**ftp-data** is still active.
ftpd_pasv_active	**ftp-data** PASV is still active.
interface_error	Cause of denial was INTERFACE ERROR.
ipsec_src	Packets to or from the rule's source address are protected by IPSEC.
ipsec_dst	Packets to or from the rule's destination address are protected by IPSEC.
ipsec_nat	NAT, if configured, is applied to packet before IPSEC encapsulates it.
no_if_check	Do not check packet for interface spoofing.
no_match_rule	Cause of denial was NO MATCH.
no_route	Cause of denial was NO ROUTE INFO.
orid=*x*	For static rules this is the rule identifier. For sessions this is the rule identifier of the rule that caused the creation of this session.
route_loop	Cause of denial was ROUTING LOOP.
session	Dynamically built session is still active.
special_static	Rule is a static rule, but built at the head of the static list.
src_frg_id= *x*	Last SRC IP fragment ID was *x*.
src_p= *x*	*x* packets have been sent from the source.
static_rule	A static rule.
s_ttl= *x* **secs**	*x* seconds must pass before a rule can be terminated after transmission of packet. (default is 30 seconds for non-TCP traffic and 86400 seconds for TCP traffic).
tcp_fin_src_rcv	Detected TCP_FIN from source.
tcp_fin_dst_rcv	Detected TCP_FIN from destination.
tcp flags=*flags*	TCP packet flags at time of denial. *flags* can be one or more of the following, separated by a comma: **URG** - TH_URG set. Packet has urgent information. **ACK** - TH_ACK set. Packet acknowledges previously sent data. **PUSH** - TH_PUSH set. Data flushes through the system. **RST** - TH_RST set. TCP connection abnormally terminates. **SYN** - TH_SYN set. TCP connection is being set up. **FIN** - TH_FIN set. TCP connection normally closes down.
tcp_synflood [**timeout =** *x*]	A SYN flood defense strategy is will be applied to sessions based on this rule.
tcp_syn_only	TCP session has not detected any data yet.
tftp_active	**tftp** is still active.
ttl= *x* **secs**	Positive value of *x* represents the number of seconds a rule has left to live; negative value of *x* represents a rule to be terminated.
two_way	Check source and destination addresses; if no match, swap them, and then check again for a match.
update_ports	Port numbers are being updated.
update_time	Timeout time is being updated for every packet match.

Active Kernel Rules Format (netguard -a, netguard -A)

The **-a** and **-A** options display all currently active sessions (permitted, proxied, and denied) as shown in the following example.

```
$ /usr/sbin/firewall/netguard -a
Ty         Host                Prot    Ports       Packets     Bytes
pe  Source       Destination   ocol  Src  Dst     Src   Dst  Src    Dst
== ============ ============== ==== ===== ===== ===== ===== ===== =====
X  qatest1       qatest3        tcp  1452 telne   112  100   4543  4854
P  cyberext1     qatest3        tcp  1070 telne    40   29   1648  1753
P  192.168.6.57  192.168.6.255  udp route route   169    0  15548     0
P  qatest2       192.168.6.255  udp   who   who    29    0   3248     0
P  qatest1       172.16.2.255   udp   who   who    11    0   1232     0
P  qatest3       192.168.6.255  udp   who   who    28    0   3664     0
```

Figure II-18. Active Kernel Rules Format (netguard -a)

Active kernel rules format (one line):

type source_address dest_address protocol source_port dest_port \
source_packet_count dest_packet_count source_byte_count dest_byte_count

Components of the active kernel rules are defined as:

type	Type of Active rule: **R** - Relay rule **P** - Permit rule **Pe** - Permit on 'Established' rule **PT** - Temporary permit static rule **Pt** - Temporary permit non-static rule **X** - Proxy rule **Xr** - Proxy 'Relay' (ongoing) rule **XT** - Temporary proxy static rule **Xt** - Temporary proxy non-static rule **D** - Deny rule **DT** - Temporary deny static rule **Dt** - Temporary deny non-static rule
source_address	Source IP address
dest_address	Destination IP address
protocol	Protocol
source_port	Source port
dest_port	Destination port
source_packet_count	Source packet transmission count
dest_packet_count	Destination packet transmission count
source_byte_count	Source byte transmission count
dest_byte_count	Destination byte transmission count

If active sessions are displayed on xterm windows with greater than 100 columns, netguard will provide the following additional information:

- Elapsed time of the session
- Slightly wider service name display
- Rule sequence number so that a session displays the sequence number of the rule from which it was generated

Packet Denial States (netguard -A)

The reason for packet denial, with one or more of the following states, is displayed if the **-A** option is used.

deny rule	Packet matches a DENY rule.
no match	Packet did not match any rule.
forward attempt	Packet is not allowed to be forwarded through the firewall.
invalid interface	Packet came in over the wrong interface.
route loop	Packet is bouncing between two routers that point to each other.
tcp flags=*flags*	TCP packet flags at time of denial. *flags* can be one or more of the following, separated by a comma: **URG** - TH_URG set. Packet has urgent information. **ACK** - TH_ACK set. Packet acknowledges previously sent data. **PUSH** - TH_PUSH set. Data flushes through the system. **RST** - TH_RST set. TCP connection abnormally terminates. **SYN** - TH_SYN set. TCP connection is being set up. **FIN** - TH_FIN set. TCP connection normally closes down.

Warning Messages

Warning messages can alert you to unique or problematic packet-filtering rules. You can suppress warning messages with the **netguard -w** command. The following table describes the **netguard** warning messages.

Table II-1. Packet-Filtering Warning Messages

Warning Message	Description
* `BASTIONHOST set: Packet forwarding disabled between interfaces`	Packets cannot be forwarded from one interface to another even though the rule permits it.
* `'Internal' to 'Internal' packet filters not supported`	A rule supporting packet transmissions internally within the firewall exists.
* `'`*`xxx`*`' to '`*`yyy`*`' packet filters unexpected`	Packets coming in through one interface are not expected to go out through the same interface.
* `Host `*`x`*` unreachable`	No routing information is available on how to reach host *x*.

Chapter 5
Network Address Translation

Network Address Translation (NAT) hides internal network addresses from external hosts and allows your company to use unregistered local Internet addresses. All traffic appears to originate or terminate at the least-trusted, external-interface addresses of the firewall. Each of these interfaces is assigned one of your company's registered Internet addresses. Figure II-19 shows how NAT protects your internal addresses.

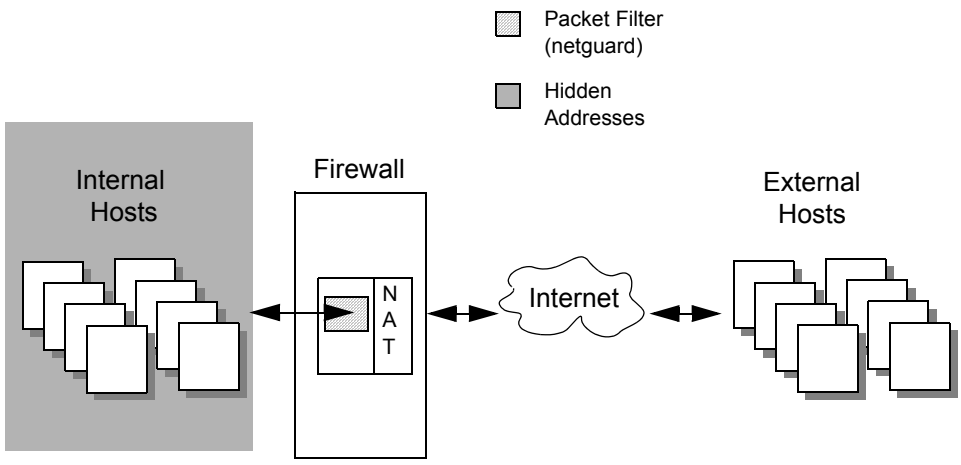


Figure II-19. Using NAT on the Firewall

Static and Dynamic Address Translation

Address translation can occur statically or dynamically.

The primary purpose of static address translation is to expose public servers or public subnetworks on the internal network to the external network, while still hiding the rest of the internal network. Static translation also allows an external host to initiate a connection to a specified internal host or network. For outbound traffic, NAT translates the source (internal) IP address to an external IP address. For inbound traffic, NAT translates the external IP address to the specified internal IP address. Static NAT does not translate port numbers, only Internet addresses. Any packets sent directly to the internal network, except those allowed by static rules, are dropped.

Dynamic address translation hides internal addresses from the external network. In dynamic mode, all transmitted packets are translated such that the source address becomes the interface's Internet address (the global address) or the global address as assigned in a NAT pool. For outbound traffic, dynamic NAT translates the source address from an internal IP address to a registered, external IP address, dynamically associating a port number with the hidden IP address. For inbound traffic, dynamic NAT translates the destination address from the external IP address to the correct internal IP address. Because NAT allocates a global port number for each connection, the reply packets to the global address/port can be translated correctly back to the originating internal address/port. Any packets sent directly to the internal network are dropped.

A subset of dynamic NAT is a NAT pool. A NAT pool specifies a group of local addresses to be translated to a group of global addresses. These addresses can be external addresses other than the external address of the firewall. More than one local address may use the same global address.

When static and dynamic NAT and NAT pools are active on an interface, the order of precedence for translation to the interface address is:

1. static translation
2. pool translation
3. dynamic translation

If a packet matches a static rule, it is translated according to that rule only. If a packet does not match a static rule but matches a pool rule, it is translated according to that rule only. Otherwise, if dynamic NAT is enabled on the interface, it is translated to the interface address.

The two modes of NAT, Static and Dynamic, can coexist. The following table compares Static and Dynamic NAT.

Table II-2. Static vs. Dynamic Network Address Translation

Attribute	Static NAT	Dynamic NAT
Makes selected internal addresses accessible	Only if a static rule translates the specified internal address for a public server or sub-network	No
External host can *initiate* communication	Only if a static rule translates the specified internal address	No
Drops packets sent directly to internal addresses	Only if *no* static rule translates the specified internal address	Yes
Uses dynamic port allocation	Only if *no* static rule translates the specified internal address	Yes

Pass Address

The **Pass Address** check box used with Dynamic NAT enables a proxy to connect to a client's IP address through to the server when opening an ongoing connection to the server on the other side of the firewall. If this option is not specified, the ongoing connection will use the firewall's IP address as the source address as shown in the following figures:

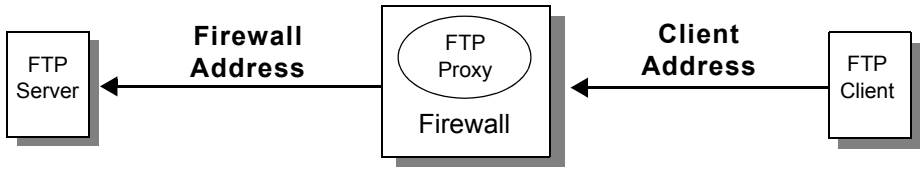


Figure II-20. Proxy Without Pass Address Option

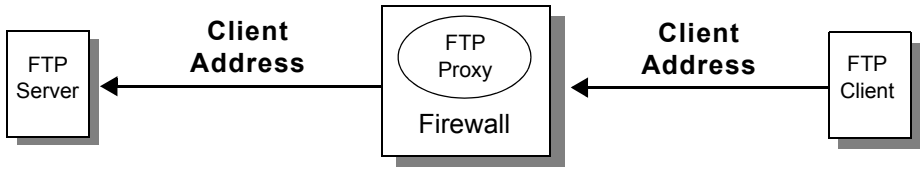


Figure II-21. Proxy With Pass Address Option

NAT and VPN

Network Address Translation can also be used in conjunction with the firewall Virtual Private Network (VPN). See "Virtual Private Network (VPN)" on page II-235, "VPN and Network Address Translation (NAT)" on page II-247, and "Packet-Filtering Rules IPSec Page" on page II-29 for more information.

Network Address Translation Window

Use this window to enable Network Address Translation (NAT) on a network interface; retain the address of an external host as a packet originator; and view, add, change, or delete externally accessible addresses for public servers and public sub-networks on the internal network on a per-interface basis. Externally accessible addresses allows externally initiated connections to internal hosts or networks. The rest of the internal network remains hidden while NAT is enabled.

Notes:

- NAT can be used in conjunction with VPN. If any IPSec rules on the IPSec page of the Packet-Filtering Rules window have **Allow NAT to Translate Addresses** checked, the network should be reinitialized. See "System Shutdown Window" on page I-35, "Packet-Filtering Rules IPSec Page" on page II-29, "Virtual Private Network (VPN)" on page II-235, and "VPN and Network Address Translation (NAT)" on page II-247 for more information.
- After clicking on **Use**, it is strongly recommended that you reinitialize the network or reboot the system.

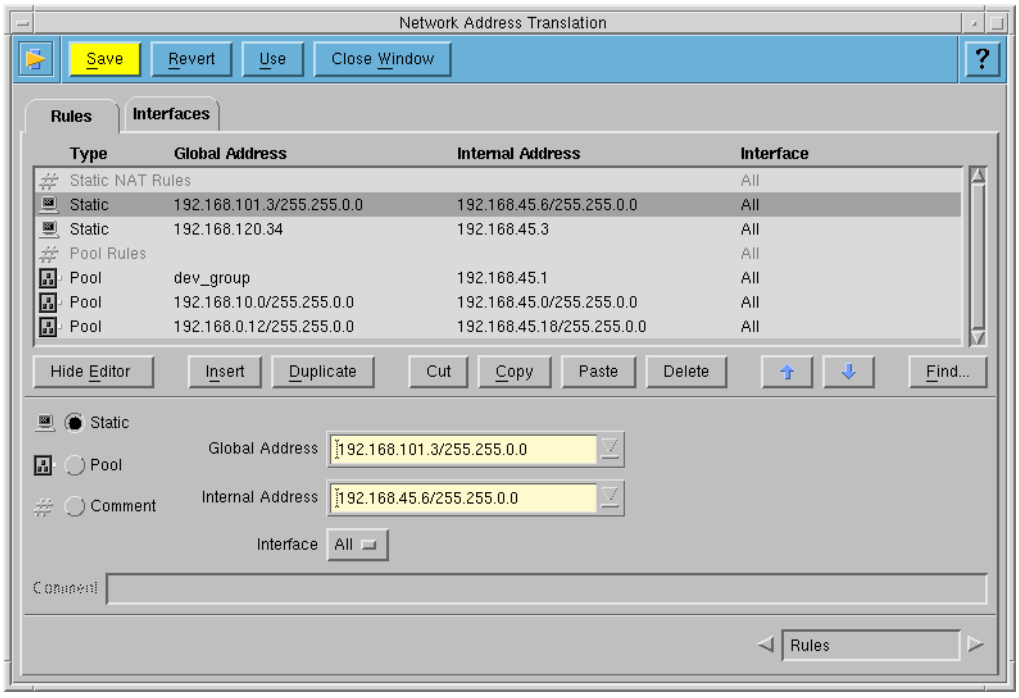


Figure II-22. Network Address Translation Window - Rules Page (Expanded)

NAT Rules Page

Use this page of the Network Address Translation window to view, add, change, or delete externally accessible addresses for public servers and public sub-networks on the internal network on a per-interface basis. This allows externally initiated connections to internal hosts or networks. (The rest of the internal network remains hidden while NAT is enabled on the Dynamic NAT Page.)

This page contains the following fields and controls:

Type — Has the following settings:

Static - (Default) Creates a static address translation rule which exposes public servers or public sub-networks on the internal network to the external network, while still hiding the rest of the internal network.

Pool - Creates a NAT pool which specifies a group of local addresses to be translated to a group of global addresses.

Comment - Treats this line as a comment; permits typing in the **Comment** field.

Global Address — Externally accessible registered IP address. For outbound packets, it is the source address after translation. For inbound packets, it is the destination address before translation.

This field can contain any valid address as defined by the packet-filtering sources and destinations (“Packet Origins and Destinations” on page II-26), except for ALL_INTERNAL, ALL_EXTERNAL, *device*_NETWORK, FIREWALL, and EVERYONE. This field cannot contain an interface address unless it is part of an address range. The drop-down list contains a list of available host groups from the Grouping window.

Internal Address — Hidden internal IP address. For outbound packets, it is the source address before translation. For inbound packets, it is the destination address after translation.

This field can contain any valid address as defined by the packet-filtering sources and destinations (“Packet Origins and Destinations” on page II-26), except for ALL_INTERNAL, ALL_EXTERNAL, *device*_NETWORK, FIREWALL, and EVERYONE. This field cannot contain an interface address unless it is part of an address range. The drop-down list contains a list of available host groups from the Grouping window.

Interface — Network interface name that applies this translation rule. All network interfaces are provided in this list. The default is **All**.

Comment — Comment text. This field may be blank.

Notes:

- If NAT is not enabled on the Interfaces page, you still can save the values. These values become useful when NAT is enabled on any external firewall interface.
- Static NAT can be activated on an internal interface, although this is not the standard configuration.
- Static NAT must be used when the HTTP and SMTP proxies are configured for multiple servers.
- Lines in this window are automatically sorted on the **Interface** field (i.e., all dec0 lines appear first, all dec1 lines appear second, etc.). You can use the up and down arrow buttons to sort lines within **Interface** groups.
- NAT pools cannot be used in conjunction with VPN NAT-Smart. NAT-Smart is the ability to choose between bypassing the firewall's Network Address Translation (NAT) or allowing NAT to Translate the internal (local) address of an IPSec connection. If the IPSec packet-filtering rule is set to **Allow NAT to Translate Addresses**, the VPN policy must be written using the would-be translated address. Because IKE peers negotiate the policy (addresses) well before an actual connection is made, the translated address must be static (i.e., predictable). With NAT pools, the translated address cannot be predicted in advance.

See also:

- "How to Configure Network Interfaces" on page I-73
- "VPN and Network Address Translation (NAT)" on page II-247
- "VPN and NAT-Traversal (NAT-T)" on page II-249
- "VPN Secure Channels - IKE Advanced Settings Dialog Box" on page II-267

NAT Interfaces Page

Use this page of the Network Address Translation window to enable NAT on an external network interface and retain the address of an external host as a packet originator.

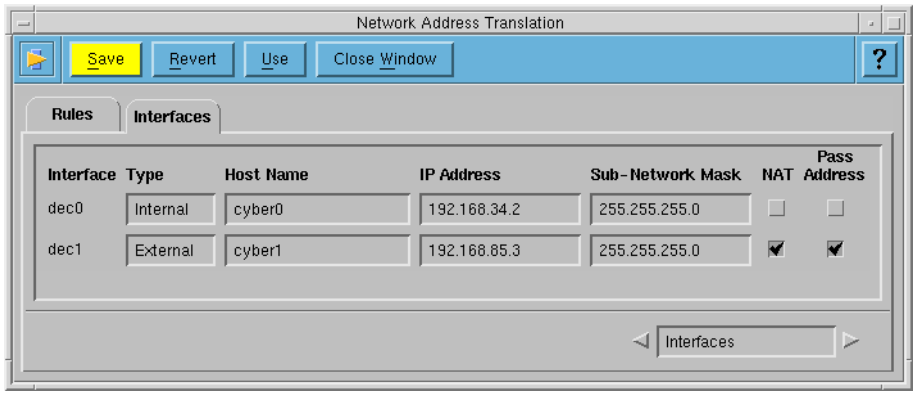


Figure II-23. Network Address Translation Window - Interfaces Page

This page contains the following fields and controls:

Interface Port name used as the network interface name.
Type Side of the firewall where the interface is connected.
Host Name Primary name of the host.
IP Address Internet Protocol address of the network interface.
Sub-Network Mask Network class described by an octet pattern.

(The preceding read-only fields reflect settings on the Network Interfaces window.)

NAT Determines if network address translation is enabled for this network interface.

Pass Address (Used by proxies) Passes the IP address of the requesting client to the real server. Otherwise, passes the firewall interface address that transmits the packets.

CAUTION!

- An internal interface with **Pass Address** set exposes internal host IP addresses to any host connected via any other interface, unless **NAT** also is enabled on that other interface.
- Changing the setting for **Pass Address** invalidates all existing automatically generated packet-filtering rules for proxies.
- This chapter describes how NAT functions when it is enabled on an external network interface. NAT can also be enabled on an internal network interface; however, this is an unusual configuration in which extreme caution and planning should be used.

Note: For outbound packets, **Pass Address** is applied before packet-filtering rules which are applied before Network Address Translation (NAT). For inbound packets, the order is reversed.

See also:

- "How to Configure Network Interfaces" on page I-73
- "SmartProxies Window" on page III-5
- "How to Enable a Standalone Proxy (startup.conf)" on page III-11

How to Configure Network Address Translation Rules

You can use the expanded Static page of the Network Address Translation window to add or change externally accessible addresses for public servers and public sub-networks on the internal network.

To display the expanded Static page:

1. Select **Configuration** from the Control Panel.
2. Select **Network Address Translation**. The Network Address Translation window appears.
3. Click on the **Rules** tab. The Rules page appears.
4. Click on **Show Editor**. The expanded Rules page appears.

To add a Static Network Address Translation rule:

1. (Optional) Select the rule that you want the new rule to follow. (Skip this step if you want to add a new rule at the top of the list.)
2. Click on **Insert**. An incomplete new line appears in the list. The **Type** field is set to **Static**.
3. Select **Static** or **Pool** in the **Type** field.
4. Type a registered IP address in the **Global Address** field.
5. Type a hidden internal address in the **Internal Address** field.
6. (Optional) Select a new network interface name in the **Interface** field.
7. Click on **Save**. Your changes take effect at the next system reboot.
8. (Optional) Click on **Use**. Your changes take effect immediately.
9. It is strongly recommended that you reinitialize the network or reboot the system.

To change a Network Address Translation rule:

1. Select the rule that you want to change.
2. Edit the fields that you want to change.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. (Optional) Click on **Use**. Your changes take effect immediately.
5. It is strongly recommended that you reinitialize the network or reboot the system.

To delete a Network Address Translation rule:

1. Select the rule that you want to delete.
2. Click on **Delete**. The rule is deleted.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. (Optional) Click on **Use**. Your changes take effect immediately.

How to Enable NAT and Retain Originating Addresses

You can use the Interfaces page of the Network Address Translation window to enable NAT on external interfaces and use the IP address of the requesting external host as the originating packet address.

CAUTION!

An internal interface with **Pass Address** set exposes internal host IP addresses to any host connected via any other interface, unless **NAT** also is enabled on that other interface.

To display the Interfaces page:

1. Select **Configuration** from the Control Panel.
2. Select **Network Address Translation**. The Network Address Translation window appears.
3. Click on the **Interfaces** tab. The Interfaces page appears.

To enable NAT and retain originating addresses:

1. For external interfaces, check the **NAT** check box to enable network address translation.
2. Check the **Pass Address** check box to use the IP address of the requesting external host as the originating address for auditing purposes.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. (Optional) Click on **Use**. Your changes take effect immediately.
5. It is strongly recommended that you reinitialize the network or reboot the system.

CAUTION!

Changing the setting for **Pass Address** invalidates all existing automatically generated packet-filtering rules for proxies.

See also “SmartProxies Window” on page III-5.

NAT - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

To configure NAT on an interface:

1. Define NAT interface options in the **/etc/security/firewall/if.conf** file. Include each interface from the **interface** file whether or not it uses any options.
2. If Network Address Translation rules are used on an interface, create and configure one configuration file for each interface on which NAT rules are used. The file must be named for the interface: **/etc/security/firewall/nat.*.conf**.
3. NAT will be enabled at boot time on any interface that uses the **Nat** keyword in the **/etc/security/firewall/if.conf** file. You also can use the **/usr/sbin/firewall/nat** command on the command line.

Notes:

- If you use dynamic address translation, connections can be initiated only from the internal side to external hosts; external hosts cannot initiate connections to your internal hosts or networks.
- The precedence of NAT types, from highest to lowest, is: static NAT, NAT pools, dynamic NAT.
- NAT should be used only for external interfaces on a firewall.

See also “Network Interface File (interface)” on page I-85.

NAT and PassClientAddr Configuration File (if.conf)

The **/etc/security/firewall/if.conf** file supplements the **interface** file with firewall-specific interface information. You must include each interface from the **interface** file even if it does not use any flags.

Notes:

- An internal interface that uses the **PassClientAddr** option from the **if.conf** file exposes internal host IP addresses to any host connected via any other interface, unless NAT also is enabled on that other interface.
- For outbound packets, **PassClientAddr** is applied before packet-filtering rules, which are applied before NAT. For inbound packets, the order is reversed.

Format guidelines:

- Each interface is on a separate line
- Each field is separated by a colon (:)
- Comments begin with the # character and continue until the end of the line

Format:

device:unit:[*flags*]

Fields:

device Identifies the controller type used for the interface. Usually, this value corresponds to the common name used for a particular device. This field cannot be null and has no default. Use the same *device* as in the **interface** file.

unit Integer that identifies a particular interface on a controller. This field cannot be null and has no default. Use the same *unit* as in the **interface** file.

flags (Optional) Can be zero or more of the following options separated by white space:

Nat
Indicates that Dynamic Network Address Translation will be initialized on this interface at boot time.

PassClientAddr
Used by proxies. Indicates that proxy servers accepting client connections on this interface should use the client's IP address as the IP source address of packets passed to the real server. By default, the firewall's IP address is used as the IP source address. This option allows servers to log valid client addresses, which are useful in generating audit reports.

The following example shows the layout of the **if.conf** file.

```
# /etc/security/firewall/if.conf
# include all interfaces from the interface file
dec:0:
dec:1:Nat PassClientAddr
```

Figure II-24. NAT and PassClientAddr Configuration File Example

See also:

- "Network Interface File (interface)" on page I-85
- "How to Enable a Standalone Proxy (startup.conf)" on page III-11
- **netstat(1M)** system manual page

Network Address Translation File (nat.*.conf)

Use the **/etc/security/firewall/nat.*.conf** file to define network address translation rules for an interface. The * represents the name of the interface. A simple "pass-through" policy can be configured by adding static translation rules with the global address equal to the internal address.

Format guidelines:

- Each rule is on a separate line
- Fields are separated by white space (spaces or tabs)
- Comments begin with the # character in the first column and continue until the end of the line

Format:

STATIC|**POOL** *global_address*[/*mask*] *local_address*[/*mask*]

Fields:

STATIC Defines a static NAT rule. The number of individual IP addresses in the local address group must be exactly the same as the number of individual addresses in the global address group regardless of whether the local and global groups are described as a group, an address range, or sub-network.

POOL Defines a NAT pool rule. The number of individual IP addresses in the local address group need not be the same as the number of individual addresses in the global address group. If the size of the global address group is larger than the size of the local address group, some of the global

addresses will not be used. If the size of the local address group is larger than the size of the global address group, some of the global addresses will be used by more than one local address.

The order of POOL rules is significant; POOL rules are searched from top to bottom.

global_address[/*mask*] — Externally accessible host or sub-network address. For outbound packets, it is the source address after translation. For inbound packets, it is the destination address before translation.

Addresses can be:
- An IP address
- An IP address with a network mask such as 192.16/16 or 192.16/255.255.0.0
- A host range such as 192.16.142.3-192.16.142.6
- A host group as defined in the Grouping window

local_address[/*mask*] — Hidden internal host or sub-network address. For outbound packets, it is the source address before translation. For inbound packets, it is the destination address after translation.

Addresses can be:
- An IP address
- An IP address with a network mask such as 192.16/16 or 192.16/255.255.0.0
- A host range such as 192.16.142.3-192.16.142.6
- A host group as defined in the Grouping window

Note: If *global_address* and *local_address* are the same, all packets to and from the host or sub-network are unmodified by NAT.

The following example shows a network address translation file.

```
#        global_address                local_address
STATIC    192.168.101.3/255.255.0.0      192.168.45.6/255.255.0.0
STATIC    192.168.120.34                 192.168.45.3
POOL      dev_group                      192.168.45.1
POOL      192.168.10.0/255.255.0.0       192.168.45.0/255.255.255.0
POOL      192.168.0.0/255.255.0.0        192.168.45.18
```

Figure II-25. Network Address Translation File Example

Network Address Translation Command (nat)

The **nat** command, used without options, displays current NAT activity. You must be a privileged user to run this command.

Syntax:

- Affects all interfaces:
  /usr/sbin/firewall/nat [**-r** | **-p**] **all**
- Display – affects a single interface:
  /usr/sbin/firewall/nat [**-d**] [**-s**] [**-S**] [**-n**] *interface*
- Reset NAT – Affects a single interface:
  /usr/sbin/firewall/nat -r *interface*
- Enable translation – affects a single interface:
  /usr/sbin/firewall/nat [**-f** *file*] [**-g** *file*] [**-i**] [**-p**] *interface*

Options and arguments:

-d Displays dynamic address translations.

-f *file* Installs static translations and pool translations from the configuration file *file*.

-g *file* Uses *file* as the group definition file. The **-g** option should be used in conjunction with the **-f** option to specify the group file to be used when parsing the configuration file.

-i Enables dynamic translations.

-n Displays the addresses in “dot” notation instead of the default domain name format. This option can be used alone or with the **-s** option.

-p Parses only the configuration.

-r Resets NAT and turns off all translations.

-s Displays static translations.

-S Displays NAT statistics.

Chapter 6
Routing

A *routing mechanism* defines how information is transferred within an internal network or between internal and external hosts. The routing mechanisms supported by the firewall are *static*, *dynamic*, and *multicast* routing. These three routing mechanisms can coexist.

Static and Dynamic Routing

Static routing is preferred over dynamic routing because it offers a more secure solution in exchange for some extra configuration effort. Table II-3 compares static and dynamic routing. Multicast routing is described in the following section.

Table II-3. Static vs. Dynamic Routing

Attribute	Static Routing	Dynamic Routing
Advantages and uses	You define each route. This makes it useful for ultra-secure systems.	Routers know primary and alternate routes. This makes it useful for systems requiring successful packet transmissions. Easy propagation of routing information is useful in large intranet configurations.
Disadvantages	Defining many routes is tedious. More administration is needed if the internal network grows.	There is little selectivity about routing information sources and recipients.
Number of direct connections to other networks	One external, many internal	Many

Table II-3. Static vs. Dynamic Routing

Attribute	Static Routing	Dynamic Routing
Supports Routing Information Protocol (RIP)	No	Yes
Supports Open Shortest Path First (OSPF)	No	Yes
Routing daemon	routed	gated

Notes:

- Several kernel tunable parameters affect the forwarding of IP packets. See "Networking Tunable Parameters" on page I-335 for details.
- IPSec source and destination addresses, configured for the firewall VPN, are not subject to normal routing. Packets for a tunnel are sent to the VPN peer of the selected secure channel.

Multicast Routing

Multicast is communication between a single sender and multiple receivers on a network. Multicast is an efficient way to distribute information to many hosts across the Internet because it conserves bandwidth and reduces traffic by simultaneously delivering a single stream of information to many recipients. Applications that take advantage of multicast technologies include video conferencing, corporate communications, distance learning, and the distribution of software, stock quotes, and news.

Multicast communications require the following elements:

- Multicast addressing
- Multicast group registration
- Multicast routing

Multicast Addressing

A multicast address enables the delivery of datagrams to hosts that have been configured as members of a multicast group. A multicast group is identified by a Class D address. Class D addresses range from 224.0.0.0 to 239.255.255.255.

The address 224.0.0.0 is reserved and cannot be assigned to any group. The multicast addresses ranging from 224.0.0.1 to 224.0.0.255 are reserved for routing protocols and other low-level topology discovery or maintenance protocols. The addresses ranging from 224.0.1.0 to 239.255.255.255 are assigned to various multicast applications or are unassigned. From this range, the addresses 239.0.0.0 to 239.255.255.255 are to be reserved for local applications, not Internet-wide applications.

Multicast Group Management

Hosts can join or leave a multicast group at any time. No restrictions are enforced on the physical location or the number of members in a multicast group. A host can be a member of more than one multicast group and need not belong to a group to send messages to the group.

A group membership protocol is employed by routers to learn about the presence of group members on their directly attached subnetworks. The CyberGuard Firewall implements Internet Group Membership Protocol (IGMP) version 2 (IGMPv2). RFC 1112 defines IGMP, and **draft-ietf-idmr-igmp-v2-01.txt** describes IGMPv2.

Based on the group membership information learned from the IGMP, a router is able to determine which multicast traffic should be forwarded to each of its "leaf" subnetworks. IGMP is only concerned with the forwarding of multicast traffic from the local router to group members on directly attached subnetworks; IGMP is not concerned with the delivery of multicast packets between neighboring routers or across an internetwork. To provide an Internet-wide delivery service, it is necessary to use a multicast routing protocol.

Multicast Routing

A multicast routing protocol defines a delivery path and forwards multicast datagrams across an internetwork. The CyberGuard Firewall implements the Distance Vector Multicast Routing Protocol (DVMRP) for multicast routing. DVMRP is derived from RIP (see RFC 1058) and defined in RFC 1075.

DVMRP, using the IP multicast routing daemon **mrouted**, implements the Reverse Path Multicasting (RPM) algorithm. Using RPM, **mrouted** forwards a multicast datagram to all "leaf" routers, which transmit "prune messages" back to the source if there are no group members on their directly attached leaf subnetworks. These prune messages result in the removal of "branches" that do not lead to group members, thus creating the shortest path tree with all leaves having group members.

The ports of a DVMRP router may be either a physical interface to a directly attached subnetwork or a tunnel interface. DVMRP tunnels are virtual point-to-point links between pairs of multicast routers located anywhere on the Internet. DVMRP tunnels are used to support multicasting among subnets that are separated by routers that do not support IP multicasting. Tunneling is accomplished using the IP-in-IP (IP encapsulation) protocol to encapsulate a multicast packet into a unicast packet and transmit that packet. The encapsulation is added on entry to a tunnel, and stripped off on exit from a tunnel.

The mrouted Command and the mrouted.conf Configuration File

The **mrouted** command can be used with or without the **mrouted.conf** configuration file. Because the **mrouted** defaults are usually adequate for basic routing, the most common multicast routing scenarios use an empty configuration file. Left in its default state, **mrouted** will query on all capable interfaces. Generally, the goal of editing **mrouted.conf** (manually or by using the Multicast Routes page of the Graphical User Interface) is to limit the scope of multicasting (by limiting the number of interfaces mrouted queries or to limit the scope of group addresses that can be used), or to configure DVMRP tunnels. Use the Defaults, Boundary Names, Interfaces, or DVMRP Tunnels pages to make such changes.

In most configuration situations, the administrator should be able to click on **Run multicast routing daemon (mrouted)** on the Multicast Routes page and use the defaults. To use **mrouted**, you must also add packet-filtering rules to allow multicast routing data through the firewall. See "Packet-Filtering Rules for Multicast Routing" on page II-104 and "Packet-Filtering Rules Window" on page II-22.

To pass multicast traffic, use the Static Routes page to define either a default route or a route that matches all multicast traffic. The **mrouted** daemon will route the packet according to its multicast routing tables. A route that matches multicast addresses should have a source of 224.0.0.0 and a mask of 240.0.0.0 or 224.0.0.0/4. See "Static Routes Page" on page II-83.

CAUTION!

This manual provides a brief overview of multicast routing and brief descriptions of each field in the GUI for multicast routing. Before using this feature or configuring multicast routing with the GUI, you must understand the concepts of multicast routing, and you must know how to use the **mrouted** command and the **mrouted.conf**.

See also the **mrouted(8)** system manual page.

Routing Window

Use this window to configure static, dynamic, and multicast routing. The Routing window has three notebook pages: Static Routes, Dynamic Routes, and Multicast Routes.

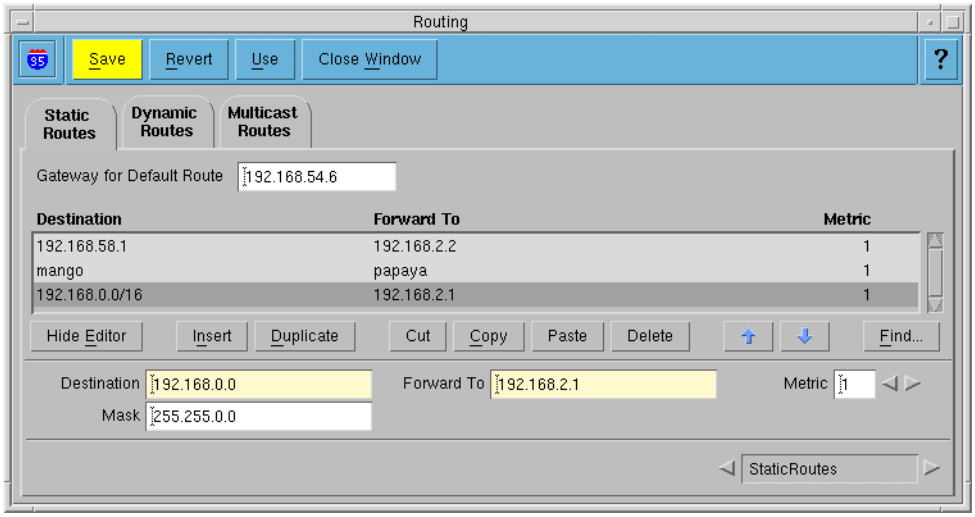


Figure II-26. Routing Window - Static Routes Page (Expanded)

Static Routes Page

Use this page of the Routing window to specify an IP address of an ISP or router or gateway to an internal network for default static routing and to view, add, change, or delete a static routing entry.

Notes:

- Every unspecified part of a network IP address is interpreted as a 0.
- Host IP addresses must have four octets.
- Host and network names must be defined on the Host Names and Network Names windows, respectively.
- Portable host names should begin with an alphanumeric character and must contain only alphanumeric characters and hyphens.

- IP addresses are translated into host and network names. If you type an IP address, save and close the window, and then reopen it, all IP addresses will be displayed as host or network names.
- To pass multicast traffic, use the Static Routes page to define either a default route or a route that matches all multicast traffic. The **mrouted** daemon will route the packet according to its multicast routing tables. A route that matches multicast addresses should have a source of 224.0.0.0 and a mask of 240.0.0.0 or 224.0.0.0/4.

This page contains the following fields and controls:

Gateway for Default Route
Specifies the host name or IP address to which packets are forwarded if no explicit route already exists. The default route must name a directly connected host using a host name or IP address. If the address is one of the firewall's network interfaces, it is considered an *interface* route (rather than a *gateway* route) and is expected to have a metric value of 0. Usually this field contains the address of your ISP.

Destination The static route destination can be one of the following:

- Name (from Host Names or Network Names window).
- IP address of the destination host.
- Group names that contains only valid routing destinations (or nested groups that meet the same requirement). If a mask is provided, it will be ignored.
- Network IP address with sub-network mask in either bit-count form (the preferred 172.16.0.0/16) or dotted-quad mask form (the more traditional 172.16.0.0/255.255.0.0).

Portable names must contain only alphanumeric characters.

Mask Sub-network mask supplied by the GUI based on what is entered in the **Destination** field. If a host is entered as the destination, the supplied mask is 255.255.255.255. A host is assumed when a resolvable host name is supplied or the IP address contains bits set in the host part of the address as determined by the mask in the **Mask** field or the default mask. If a sub-network mask prefix bit count is entered with the destination IP address, the corresponding dotted-quad mask will replace the content of the Mask field. In other cases, the Mask field will be supplied with the default sub-network mask only if the Mask field was previously blank.

You may override the supplied mask as long as the resulting destination and mask combine to form a valid host or network specification (e.g., a mask other than 255.255.255.255 cannot be used if bits are set in the destination corresponding to the host part of the address).

IP addresses are resolved to host names when they are displayed in the list in the top portion of the window or when selected and displayed in the edit area at the bottom of the window. If the address cannot be resolved to a name, the address is shown. If the address is that of a network, the sub-network prefix bit count is appended.

Forward To If the **Metric** value is greater than 0, this field represents the host name (from Host Names window) or IP address of the *gateway* to which packets should be forwarded. If the **Metric** value is equal to 0, this field represents the interface name, host name, or IP address of one of the firewall's network *interfaces*.

Metric The **Metric** value is interpreted by the underlying routing system. When dynamic routing is not running, this value is usually a *hop-count* (the number of network nodes between this system and the destination) but may be weighted to indicate a cost for traversing the route. When dynamic routing is running, this number is the *preference* value represents the rank used to select a route when both static and dynamic routes to the same destination exist. In this case values around 60 are recommended to compete reasonably with other dynamic routing protocols. 0 is the highest rank, and 255 is the lowest rank. A metric of 0 represents an interface route. A metric of 1 or greater represents a gateway route. Interface routes (metric of 0) are automatically established at boot time. It is rare that it will be necessary to add additional interface routes. The default value in this field is 1.

See also:

- "Network Interfaces Window" on page I-68
- "Host Names Window" on page II-1
- "Grouping Window" on page II-10
- "Packet-Filtering Rules Window" on page II-22
- "How to Configure Static Routing" on page II-106
- "Routing - Underlying Constructs" on page II-109
- "Alerts Page" on page II-328 for responding to packet forwarding attacks

Dynamic Routes Page

Use this page of the Routing window to start dynamic routing, enable automatic packet-filtering rules for RIP, and configure dynamic routes.

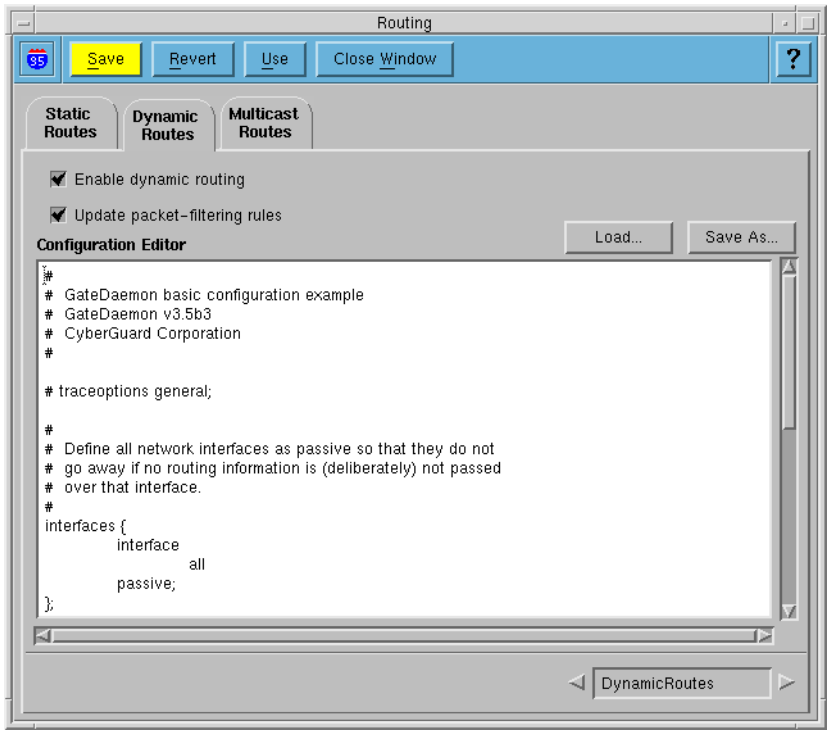


Figure II-27. Routing Window - Dynamic Routes Page

This page contains the following fields and controls:

Enable dynamic routing
Determines if any *dynamic* routing will occur; *static* routing occurs regardless of this check box.

Update packet-filtering rules
If **Enable dynamic routing** is checked, automatically installs or removes RIP-specific packet-filtering rules for dynamic routing. If you are using a dynamic routing protocol other than RIP (by editing the **gated.conf** file), you must use the Packet-Filtering Rules window to add your own protocol-specific packet-filtering rules.

Configuration Editor
Displays **/etc/security/firewall/gated.conf**, the dynamic routing configuration file. Use this area to view or edit the configuration file.

Load Opens the Configuration Templates window, which provides a list of templates that will assist in the creation of a **gated.conf** file. Note that these templates are intended as a reference. You must thoroughly understand the **gated**

daemon and the **gated.conf** file to securely configure dynamic routing. See “Dynamic Routing Templates” on page II-87 for additional information.

Save As Saves the current dynamic routing configuration file under a new name. After you have configured the file you want to use for dynamic routing, be certain that it is named **/etc/security/firewall/gated.conf**.

The GateD Consortium’s manual, “GateD, A routing daemon for Unix, User Manual” is available online.

See also:

- **gated(1M)** system manual page
- GateD Consortium Web page: **http://www.merit.edu**
- GateD Consortium e-mail: **consortium-interest@gated.merit.edu**

Dynamic Routing Templates

Clicking on the **Load** button on the Dynamic Routes page of the Routing window opens the Configuration Templates selection window. The following dynamic routing templates are provided to assist in the configuration of the gated daemon. These file examples are located in the **/etc/security/firewall/gated** directory. To save your own template or alternate configuration files, click on the **Save As** button.

- **Basic configuration**
- **Advanced configuration**
- **RIP configuration**
- **OSPF configuration**
- **OSPF for high availability, primary**
- **OSPF for high availability, secondary**

Additional templates from the GateD Consortium are also provided.

Multicast Routes Page

Use this page of the Routing window to enable multicast routing, to limit the scope of multicasting, or to configure DVMRP tunnels.

Note: To pass multicast traffic, use the Static Routes page to define either a default route or a route that matches all multicast traffic. The **mrouted** daemon will route the packet according to its multicast routing tables. A route that matches multicast addresses should have a source of 224.0.0.0 and a mask of 240.0.0.0 or 224.0.0.0/4. See “Static Routes Page” on page II-83.

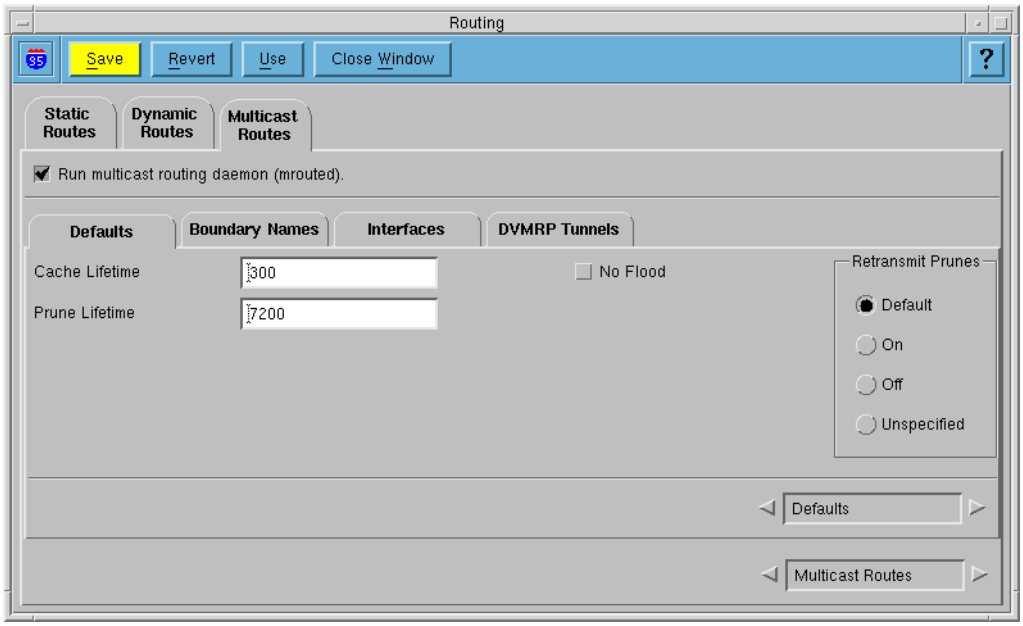


Figure II-28. Routing Window - Multicast Routes Page

This page contains the following control:

Run multicast routing daemon (mrouted)
Enables multicast routing by starting the IP multicast routing daemon, **mrouted**.

See also the **mrouted(8)** system manual page.

Multicast Routes - Defaults Page

Use this page of the Routing window to configure the overall operation of multicast routing.

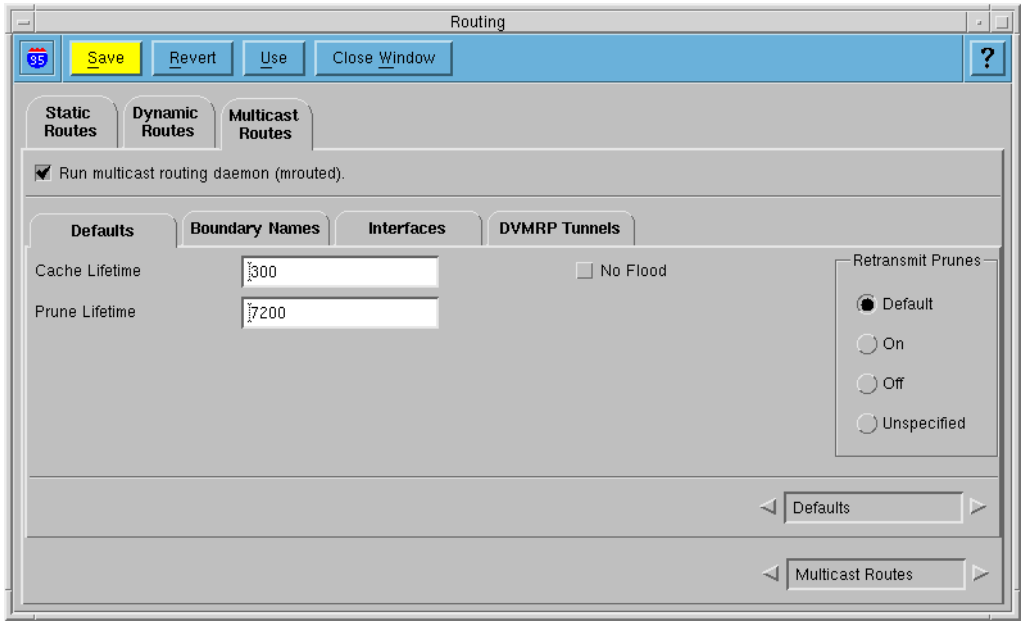


Figure II-29. Routing Window - Multicast Routes, Defaults Page

This page contains the following fields and controls:

Cache Lifetime Specifies, in seconds, the lifetime of a multicast forwarding cache entry in the kernel. Multicast forwarding cache entries are checked at the specified interval and are refreshed if the source is still active and deleted if they are not active. A low value will keep the kernel cache small, but the cache will be checked often for periodic senders; however, a high value can cause the kernel cache to grow unacceptably large. The default is 300 seconds (5 minutes).

Prune Lifetime Specifies, in seconds, the average lifetime of prune messages that are sent back to the source. The default is 7200 (2 hours). Smaller values cause less data to be kept both at the router and the parent, at the cost of more frequent broadcasts.

Note that some routers (such as **mrouted** prior to version 3.3 and all versions of Cisco's IOS) do not use the DVMRP generation ID to determine that a neighbor has rebooted. Prunes sent towards these neighbors should be kept short in order to shorten the time to recover from a reboot. In this situation, the Prune Lifetime can be assigned to a specific interface, as described in "Multicast Routes - Interfaces, VIF Options Page" on page II-94.

No Flood The multicast routing daemon (**mrouted**) assumes that it is the forwarder for each of its attached subnets on startup. This can cause duplicate packets for a short period (approximately one full route report interval), since both the router that just started up and the correct forwarder will be forwarding traffic. Checking **No Flood** turns off this behavior; **mrouted** will not assume that it is the forwarder on startup. Note that checking **No Flood** can cause black holes (a situation in which packets disappear because a router does not forward packets but thinks it can) on restart, which will last approximately one full route report interval. **No Flood** can also be specified on individual interfaces as described in "Multicast Routes - Interfaces, VIF Options Page" on page II-94 or on DVMRP tunnels as described in "Multicast Routes - DVMRP Tunnels, VIF Options Page" on page II-100.

Retransmit Prunes The default behavior (**Default**) of multicast routing is to retransmit prune messages on all point-to-point interfaces (including tunnels) but not on multi-access interfaces. **On** causes the retransmission of prunes on all interfaces. **Off** disables the retransmission of prunes. **Unspecified** indicates that this option is not defined in the configuration file and the default behavior will be used.

Retransmit Prunes can also be specified on individual interfaces as described in "Multicast Routes - Interfaces, VIF Options Page" on page II-94 or on tunnels as described in "Multicast Routes - DVMRP Tunnels, VIF Options Page" on page II-100.

See also the **mrouted(8)** system manual page.

Multicast Routes - Boundary Names Page

Use this page of the Routing window to restrict the scope of a broadcast. Boundary statements are an effective way to manage multicast domains by preventing multicast traffic from traversing external links.

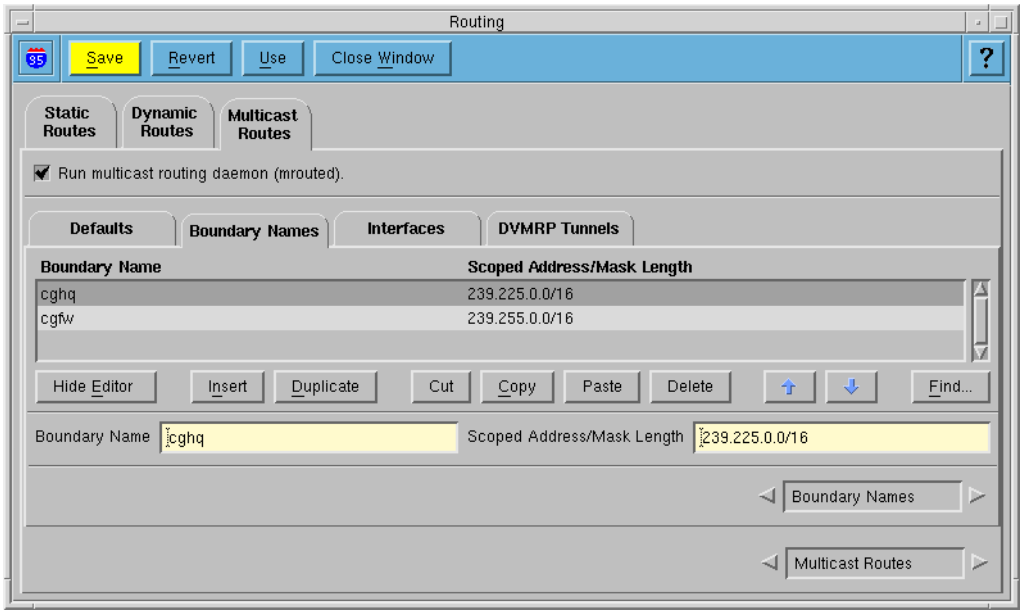


Figure II-30. Routing Window - Multicast Routes, Boundary Names Page

This page contains the following fields:

Boundary Name
Name of the boundary that beyond which the router should not forward packets.

Scoped Address/Mask Length
Restricts the router from forwarding packets beyond the specified address. The **Scoped Address** must be in the range 239.0.0.0 to 239.255.255.255.

See also the **mrouted(8)** system manual page.

Multicast Routes - Interfaces Page

Use this page of the Routing window to view and select for configuration the names of individual interfaces that have their own multicast routing configurations.

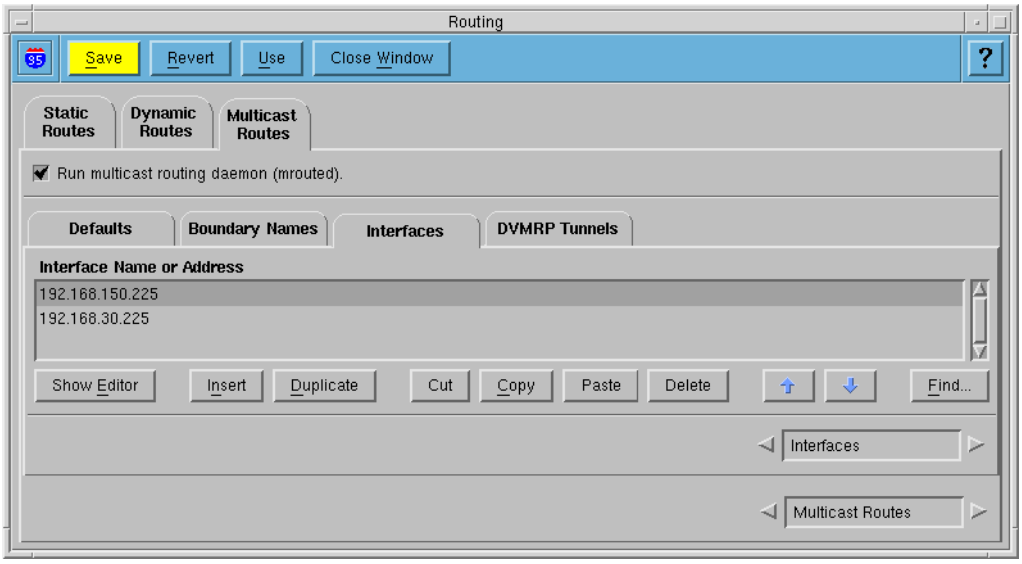


Figure II-31. Routing Window - Multicast Routes, Interfaces Page

See also the **mrouted(8)** system manual page.

Multicast Routes - Interfaces, Interface Options Page

Use this page of the Routing window to assign a multicast routing configuration to a specific interface.

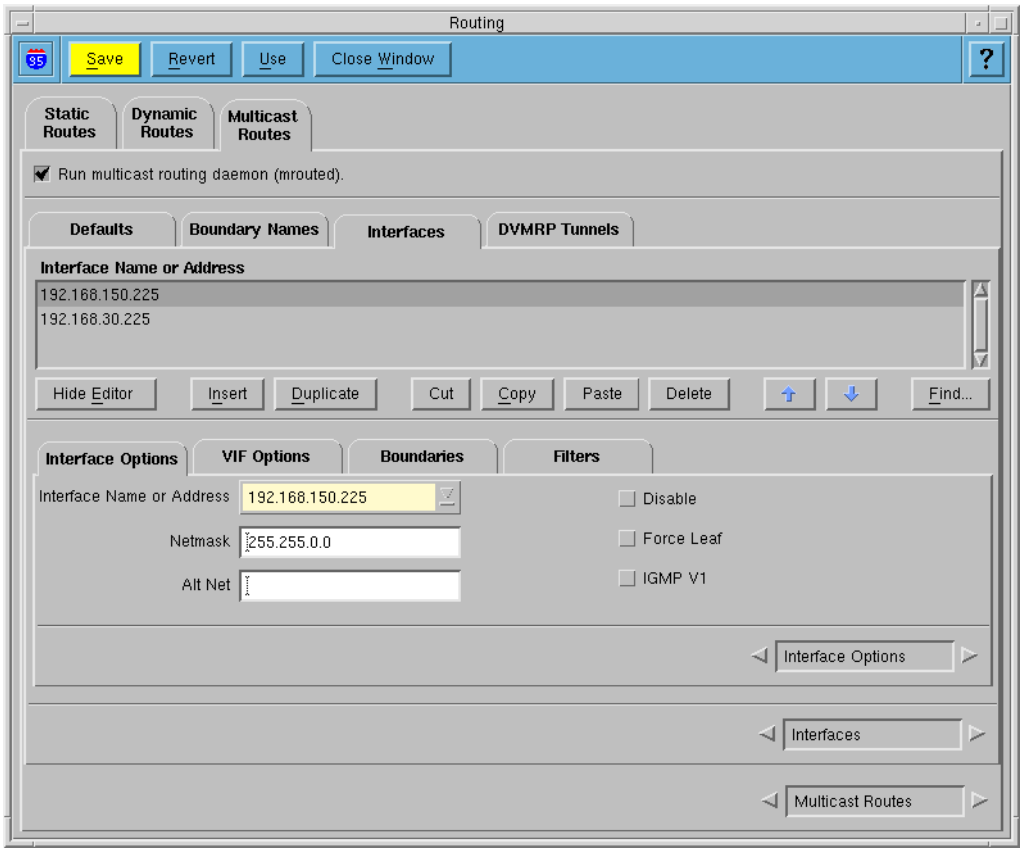


Figure II-32. Routing Window - Multicast Routes, Interfaces, Interface Options Page

This page contains the following fields and controls:

Interface Name or Address
(Read only) Name or IP address of the interface associated with an individual multicast routing configuration.

Netmask Subnetwork mask of the interface.

Alt Net If the **Interface Name or Address** is attached to multiple IP subnetworks, describe each additional subnetwork in the format of *IP_address/mask_length*. One or more subnetworks, separated by spaces, can be specified (e.g., `192.168.3.0/24 192.168.4.0/24`).

Disable Disables multicast forwarding on this interface. By default, the multicast routing daemon discovers all locally attached multicast-capable interfaces and forwards on all of them.

Force Leaf Forces the multicast routing daemon to ignore other routers on this interface. **mrouted** will never send or accept neighbor probes or route reports on this interface.

IGMP V1 Forces mrouted into IGMPv1 mode if there are any IGMPv1 routers on the interface. All routers on the interface must use the same version of IGMP.

See also the **mrouted(8)** system manual page.

Multicast Routes - Interfaces, VIF Options Page

Use this page of the Routing window to configure a Virtual Interface (VIF).

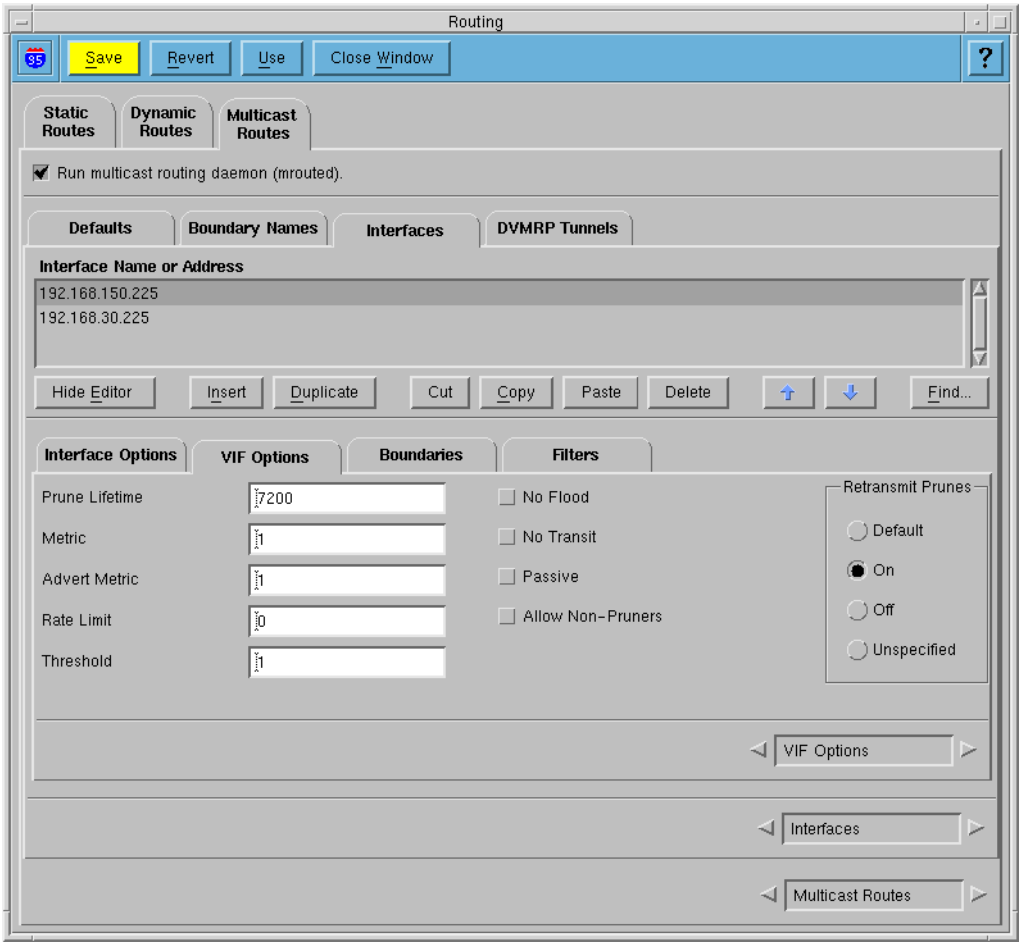


Figure II-33. Routing Window - Multicast Routes, Interfaces, VIF Options Page

This page contains the following fields and controls:

Prune Lifetime Specifies, in seconds, the average lifetime of prune messages that are sent back to the source. The default is 7200 (2 hours). Smaller values cause less data to be kept both at the router and the parent, at the cost of more frequent broadcasts.

Note that some routers (such as **mrouted** prior to version 3.3 and all versions of Cisco's IOS) do not use the DVMRP generation ID to determine that a neighbor has rebooted. Prunes sent towards

these neighbors should be kept short in order to shorten the time to recover from a reboot. In this situation, the Prune Lifetime can be assigned to a specific interface.

Metric — The "cost" associated with receiving a datagram on the given interface, the metric may be used to influence the choice of routes. When a datagram is received, it is associated with a time-to-live (TTL) value. The metric is subtracted from the TTL, and if the TTL is greater than zero, the packet is forwarded. The **Metric** value should be kept as small as possible, because DVMRP cannot route along paths with a sum of metrics greater than 31. The default is 1.

Advert Metric — The "cost" associated with receiving a datagram on the given interface, the metric may be used to influence the choice of routes. The effective metric of a link is one end's **Metric** plus the other end's **Advert Metric**. The default is 0.

Rate Limit — Specifies the bandwidth in Kbits/second allocated to multicast traffic. The default is 0 (unlimited).

Threshold — Used to control the scope of multicast datagrams, the threshold specifies the minimum IP time-to-live required for a multicast datagram to be forwarded to the interface or tunnel. The default threshold is 1.

No Flood — The multicast routing daemon (**mrouted**) assumes that it is the forwarder for each of its attached subnets on startup. This can cause duplicate packets for a short period (approximately one full route report interval), since both the router that just started up and the correct forwarder will be forwarding traffic. Checking **No Flood** turns off this behavior; **mrouted** will not assume that it is the forwarder on startup. Note that checking **No Flood** can cause black holes (a situation in which packets disappear because a router does not forward packets but thinks it can) on restart, which will last approximately one full route report interval.

Used on the VIF options page, **No Flood** is applicable to this interface only.

No Transit — Prohibits routes learned from an interface marked **No Transit** to be advertised on another interface marked **No Transit**. Marking a single interface **No Transit** has no meaning; two or more interfaces must be marked **No Transit**. This is a specialized case of route filtering.

Passive — Indicates that no packets will be sent on this interface or tunnel until the routing daemon hears from the other end.

Allow Non-Pruners — By default, **mrouted** refuses to peer with DVMRP neighbors that do not claim to support pruning. This option allows such peerings on this interface.

Retransmit Prunes — The default behavior (**Default**) of multicast routing is to retransmit prune messages on all point-to-point interfaces (including

tunnels) but not on multi-access interfaces. **On** causes the retransmission of prunes on all interfaces. **Off** disables the retransmission of prunes. **Unspecified** indicates that this option is not defined in the configuration file and the default behavior will be used.
Used on the VIF options page, **Retransmit Prunes** is applicable to this interface only.

See also the **mrouted(8)** system manual page.

Multicast Routes - Interfaces, Boundaries Page

Use this page of the Routing window to restrict the scope of a broadcast. Boundary statements are an effective way to manage multicast domains by preventing multicast traffic from traversing external links.

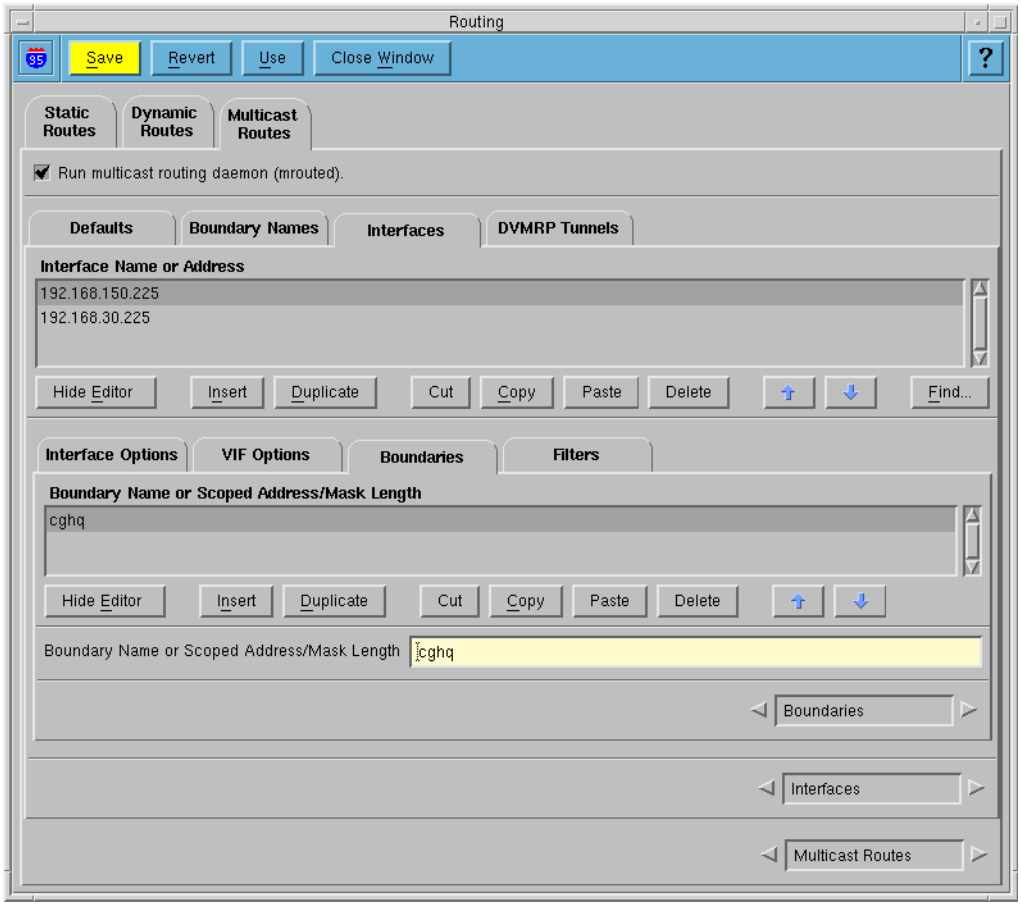


Figure II-34. Routing Window - Multicast Routes, Interfaces, Boundaries Page

This page contains the following field:

Boundary Name or Scoped Address/Mask Length
Name of the boundary or the IP address/mask length beyond which the router should not forward packets. The **Scoped Address** must be in the range

239.0.0.0 to 239.255.255.255. Boundary names are defined on the “Multicast Routes - Boundary Names Page” on page II-90.

See also the **mrouted(8)** system manual page.

Multicast Routes - Interfaces, Filters Page

Use this page of the Routing window to enforce route filtering on an interface.

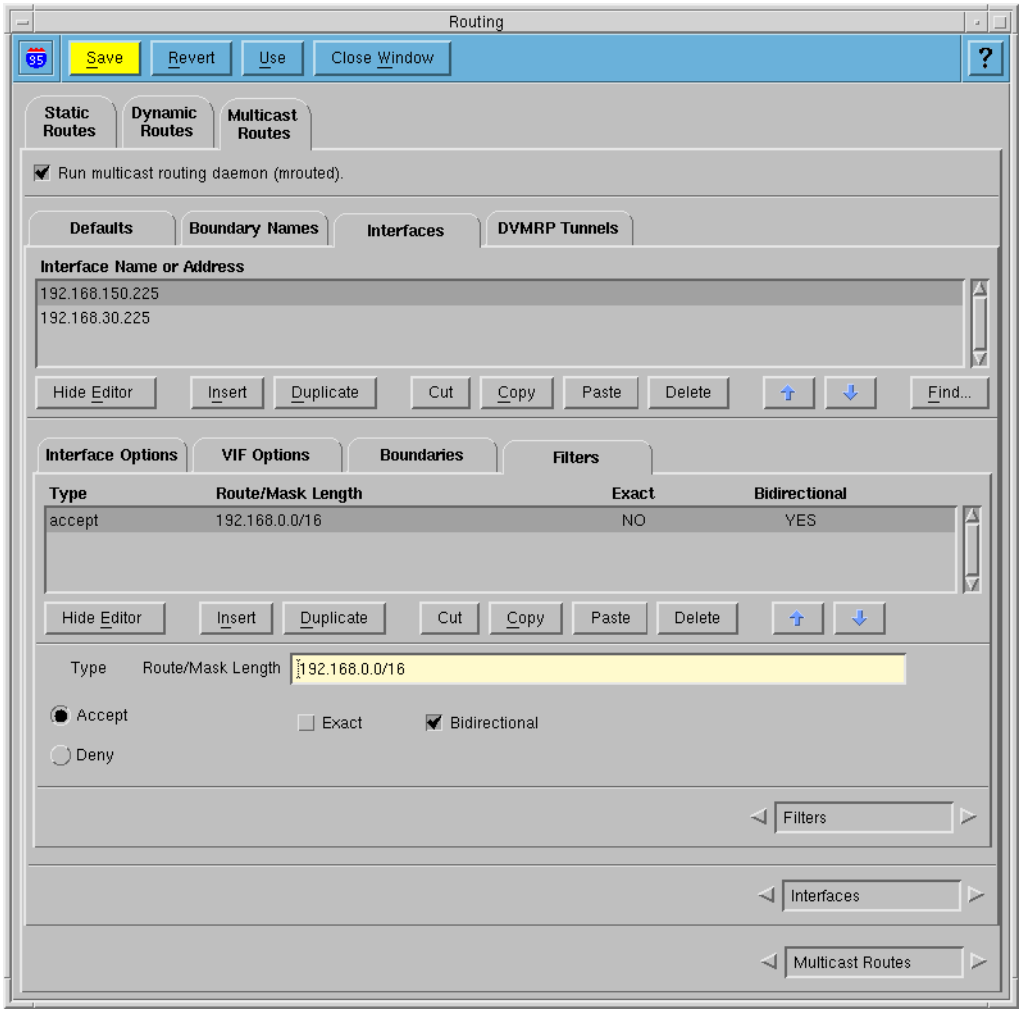


Figure II-35. Routing Window - Multicast Routes, Interfaces, Filters Page

This page contains the following fields and controls:

Accept Accepts only the listed routes on the configured interface.

Deny Accepts all routes except the listed routes.

Route/Mask Length
Route to accept or deny.

Exact Indicates that only that specified route is matched. If **Exact** is not checked, the specified route and any more specific route is matched. For example, **deny 0/0** denies all routes, while **deny 0/0 Exact** denies only the default route.

Bidirectional Enables bidirectional route filtering in which the filter (Accept or Deny) is applied to routes on both output and input. If Bidirectional is not checked, the filter is only applied on input. Poison reverse routes are never filtered out. (*Poison reverse* is a technique that helps upstream DVMRP routers determine if a downstream router is dependent upon them for forwarding multicast traffic from certain source networks.)

See also the **mrouted(8)** system manual page.

Multicast Routes - DVMRP Tunnels Page

Use this page of the Routing window to view and select for configuration the local and remote names of DVMRP tunnels that have their own multicast routing configurations.

Note: Source-based pruning is not part of the current IP Multicast specification; it is included in the next version, IGMP-3, which is under review by the IETF.

This means that when static NAT is enabled, prunes returning through a DVMRP tunnel are not handled properly by **mrouted**. When a source behind the NAT sends the first packet, it is forwarded by the firewall to its neighboring router through the tunnel. Since no hosts have subscribed to that group, **mrouted** at the other end of the tunnel sends back a prune message. Subsequent packets sent to the group should no longer be forwarded by **mrouted** on that interface. However, these prune messages are not handled correctly by **mrouted**, and packets are still forwarded.

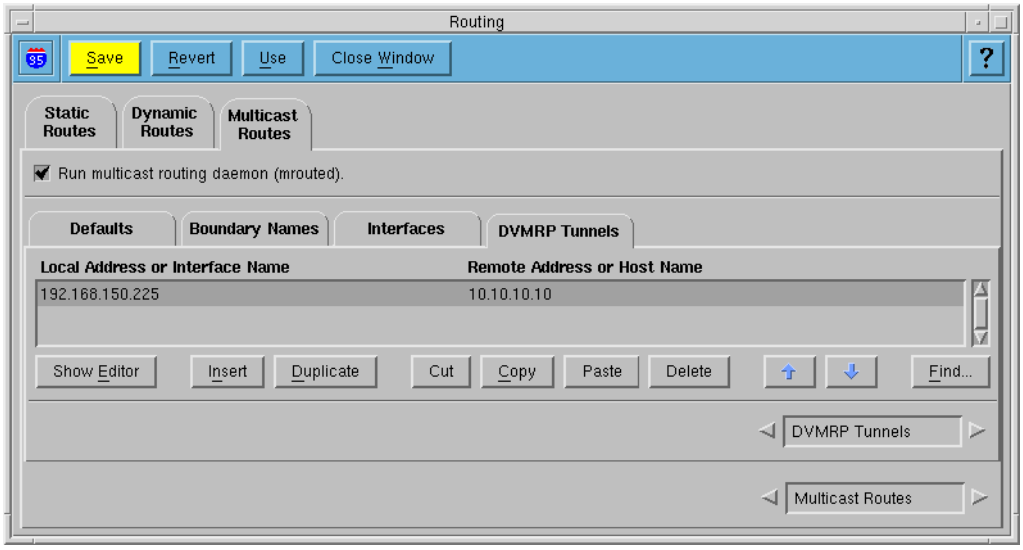


Figure II-36. Routing Window - Multicast Routes, DVMRP Tunnels Page

See also the **mrouted(8)** system manual page.

Multicast Routes - DVMRP Tunnels, Tunnel Options Page

Use this page of the Routing window to establish a tunnel between a local host and a remote host.

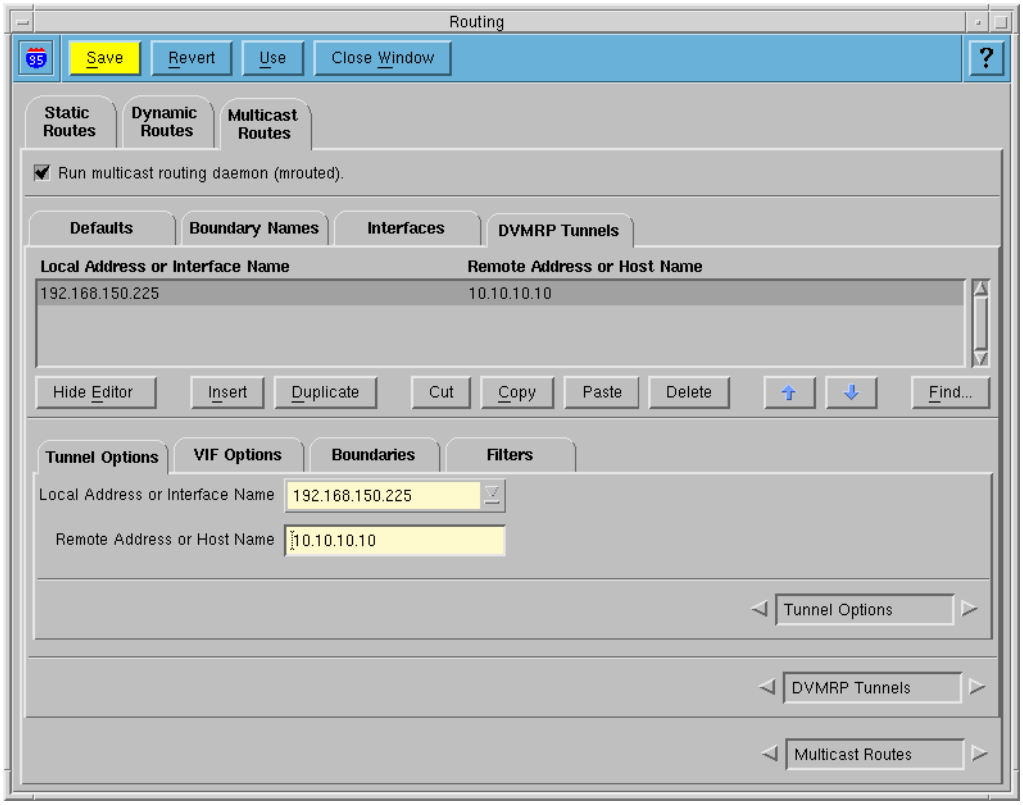


Figure II-37. Routing Window - Multicast Routes, DVMRP Tunnels, Tunnel Options Page

This page contains the following fields:

Local Address or Interface Name
IP address or interface name of the local host on the tunnel.

Remote Address or Host Name
IP address or host name of the remote host on the tunnel. The Host Name may be used only if it maps to a single IP address. A tunnel must be configured on both routers before it can be used. Be careful that the unicast route to the remote address goes out the interface specified by the **Local Address or Interface Name**. Note that some UNIX kernels rewrite the source address of **mrouted**'s packets on their way out to contain the address of the transmission interface. This is best assured via a static host route.

See also the **mrouted(8)** system manual page.

Multicast Routes - DVMRP Tunnels, VIF Options Page

Use this page of the Routing window to configure a Virtual Interface (VIF) on a tunnel.

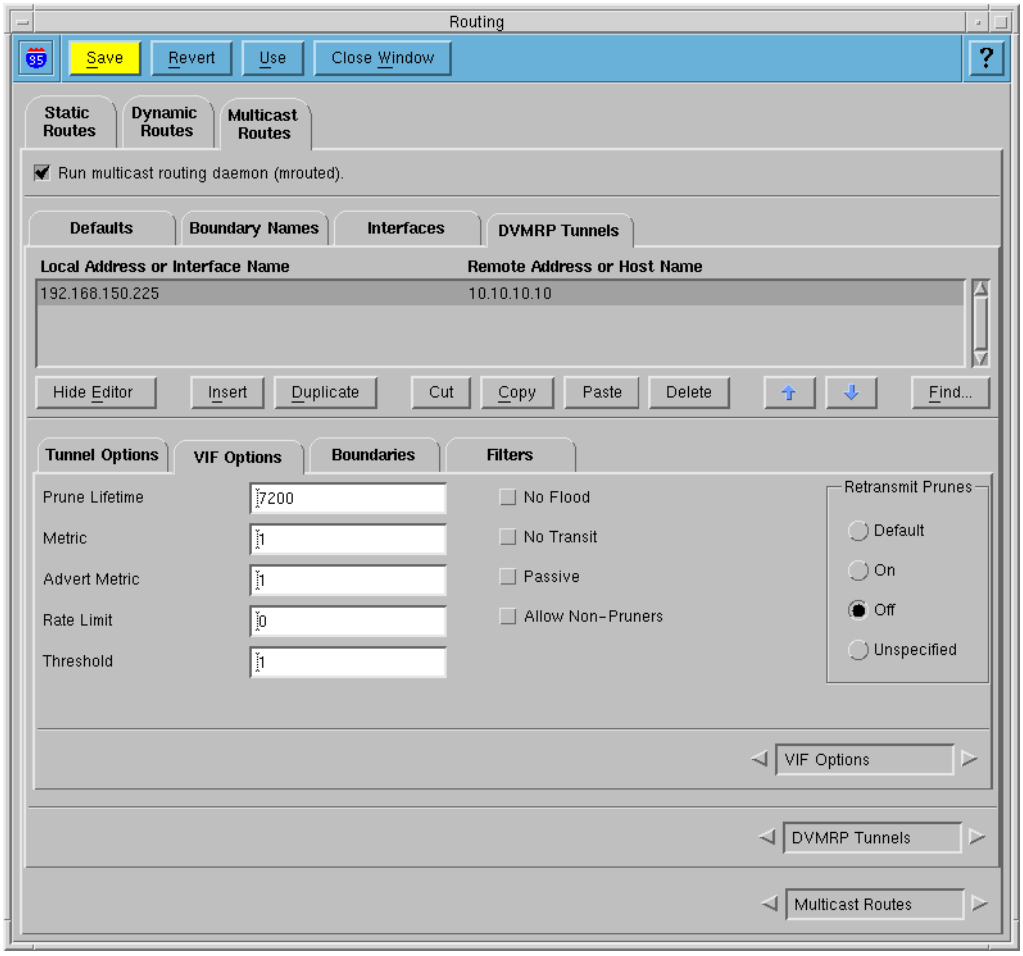


Figure II-38. Routing Window - Multicast Routes, DVMRP Tunnels, VIF Options Page

This page contains the following fields and controls:

Prune Lifetime Specifies, in seconds, the average lifetime of prune messages that are sent back to the source. The default is 7200 (2 hours). Smaller values cause less data to be kept both at the router and the parent, at the cost of more frequent broadcasts.

Note that some routers (such as **mrouted** prior to version 3.3 and all versions of Cisco's IOS) do not use the DVMRP generation ID to determine that a neighbor has rebooted. Prunes sent towards these neighbors should be kept short in order to shorten the time to recover from a reboot. In this situation, the Prune Lifetime can be assigned to a specific interface.

Metric The "cost" associated with receiving a datagram on the given interface, the metric may be used to influence the choice of routes. When a datagram is received, it is associated with a time-to-live (TTL) value. The metric is subtracted from the TTL, and if the TTL is greater than zero, the packet is forwarded. The **Metric** value should be kept as small as possible, because DVMRP cannot route along paths with a sum of metrics greater than 31. The default is 1.

Advert Metric The "cost" associated with receiving a datagram on the given interface, the metric may be used to influence the choice of routes. The effective metric of a link is one end's **Metric** plus the other end's **Advert Metric**. The default is 0.

Rate Limit Specifies the bandwidth in Kbits/second allocated to multicast traffic. The default is 0 (unlimited).

Threshold Used to control the scope of multicast datagrams, the threshold specifies the minimum IP time-to-live required for a multicast datagram to be forwarded to the interface or tunnel. The default threshold is 1.

No Flood The multicast routing daemon (**mrouted**) assumes that it is the forwarder for each of its attached subnets on startup. This can cause duplicate packets for a short period (approximately one full route report interval), since both the router that just started up and the correct forwarder will be forwarding traffic. Checking **No Flood** turns off this behavior; **mrouted** will not assume that it is the forwarder on startup. Note that checking **No Flood** can cause black holes (a situation in which packets disappear because a router does not forward packets but thinks it can) on restart, which will last approximately one full route report interval.

Used on the VIF options page, **No Flood** is applicable to this tunnel only.

No Transit Prohibits routes learned from an interface marked **No Transit** to be advertised on another interface marked **No Transit**. Marking a single interface **No Transit** has no meaning; two or more interfaces must be marked **No Transit** This is a specialized case of route filtering.

Passive Indicates that no packets will be sent on this tunnel until the routing daemon hears from the other end. This is useful for the server end of a tunnel that goes over a dial-on-demand link. If the server end is configured as passive, it will not send its periodic probes until it hears one from the other side, so it will not keep the link up. If this option is specified on both ends of a tunnel, the tunnel will never come up.

Allow Non-Pruners By default, **mrouted** refuses to peer with DVMRP neighbors that do not claim to support pruning. This option allows such peerings on this interface.

Retransmit Prunes The default behavior (**Default**) of multicast routing is to retransmit prune messages on all point-to-point interfaces (including tunnels) but not on multi-access interfaces. **On** causes the retransmission of prunes on all interfaces. **Off** disables the retransmission of prunes. **Unspecified** indicates that this option is not defined in the configuration file and the default behavior will be used.

Used on the VIF options page, **Retransmit Prunes** is applicable to this tunnel only.

See also the **mrouted(8)** system manual page.

Multicast Routes - DVMRP Tunnels, Boundaries Page

Use this page of the Routing window to restrict the scope of a broadcast. Boundary statements are an effective way to manage multicast domains by preventing multicast traffic from traversing external links.

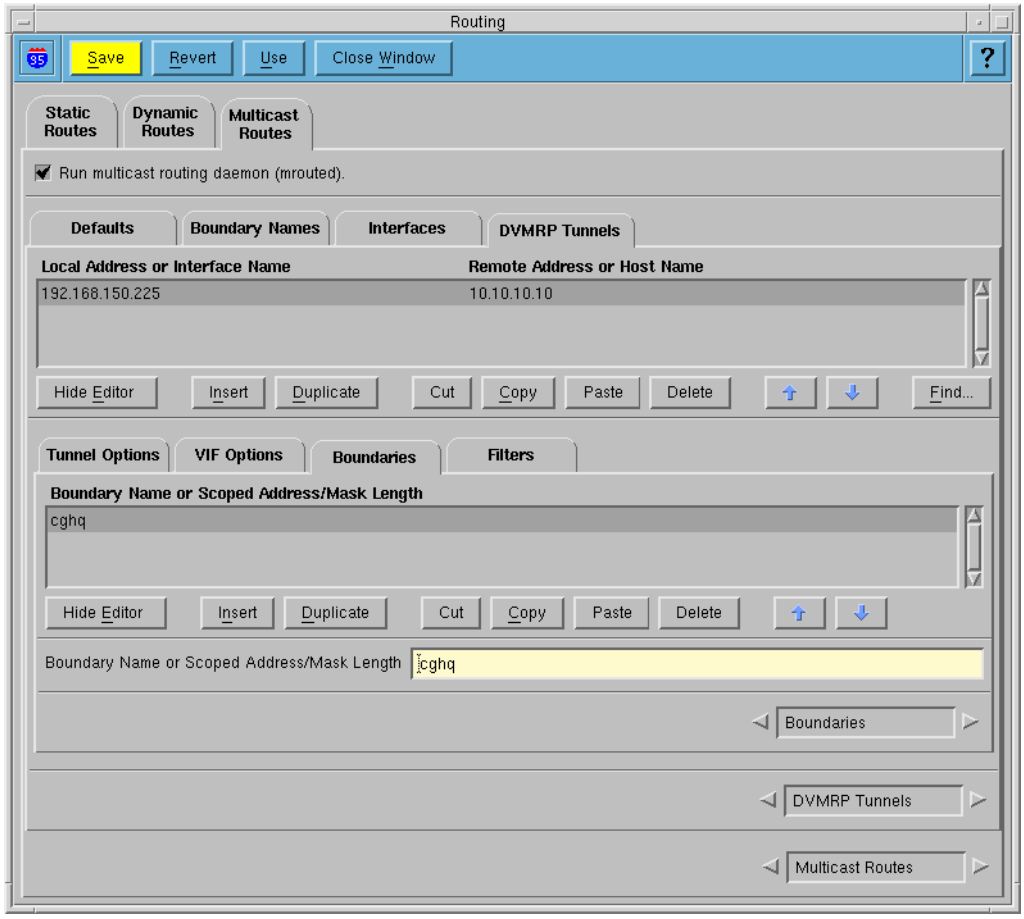


Figure II-39. Routing Window - Multicast Routes, DVMRP Tunnels, Boundaries Page

This page contains the following field:

Boundary Name or Scoped Address/Mask Length
Name of the boundary or the IP address/mask length beyond which the router should not forward packets. The **Scoped Address** must be in the range 239.0.0.0 to 239.255.255.255. Boundary names are defined on the "Multicast Routes - Boundary Names Page" on page II-90.

See also the **mrouted(8)** system manual page.

Multicast Routes - DVMRP Tunnels, Filters Page

Use this page of the Routing window to enforce route filtering on a tunnel.

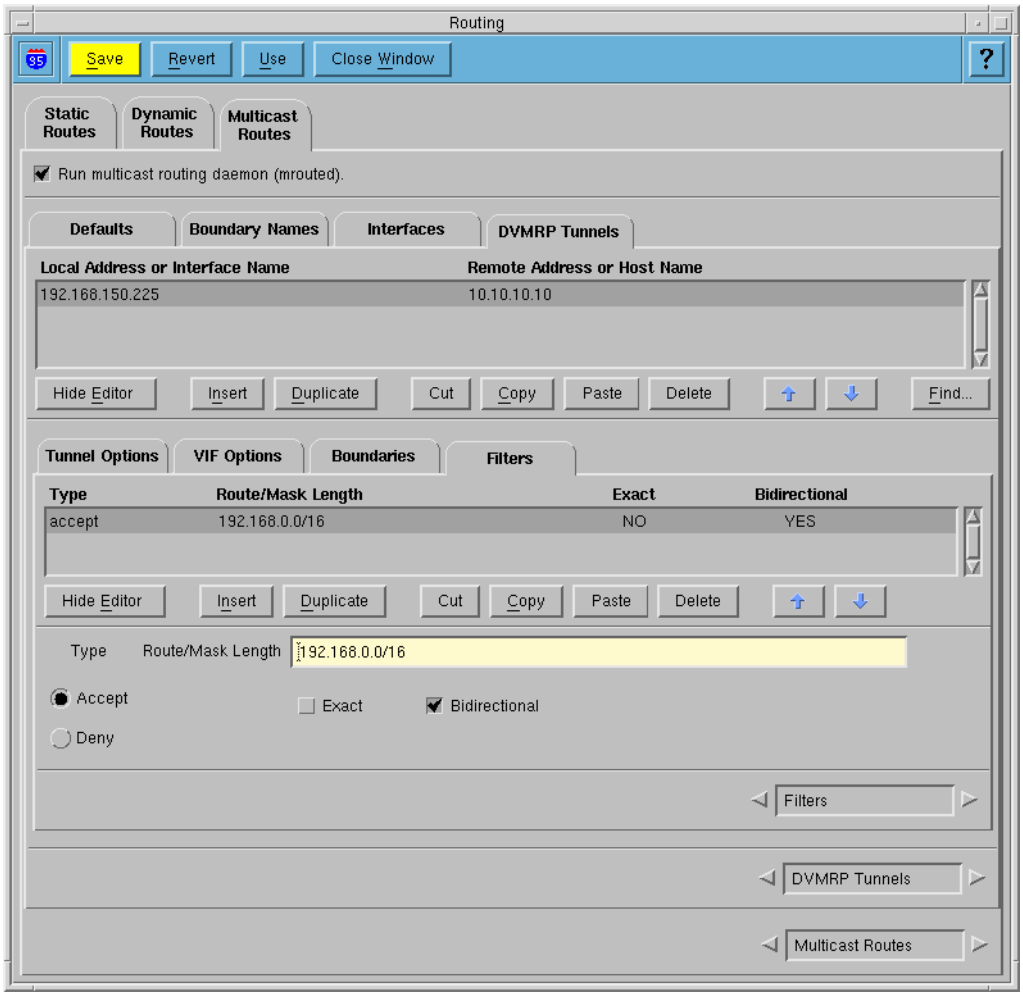


Figure II-40. Routing Window - Multicast Routes, DVMRP Tunnels, Filters Page

This page contains the following fields and controls:

Accept Accepts only the listed routes on the configured interface.

Deny Accepts all routes except the listed routes.

Route/Mask Length
Route to accept or deny.

Exact Indicates that only that specified route is matched. If Exact is not checked, the specified route and any more specific route is matched. For example, **deny 0/0** denies all routes, while **deny 0/0 exact** denies only the default route.

Bidirectional Enables bidirectional route filtering in which the filter (Accept or Deny) is applied to routes on both output and input. If Bidirectional is not checked, the filter is only applied on input. Poison reverse routes are never filtered out. (*Poison reverse* is a technique that helps upstream DVMRP routers determine if a downstream router is dependent upon them for forwarding multicast traffic from certain source networks.)

See also the **mrouted(8)** system manual page.

Packet-Filtering Rules for Dynamic Routing

The following packet-filtering rules are added for each interface when dynamic routing is enabled and **Update packet-filtering rules** is checked on the Dynamic Routes page of the Routing window. Use the Packet-Filtering Rules window to review all automatic packet-filtering rules. You should delete packet-filtering rules that have been added on interfaces on which routing is not being used and possibly add additional, more specific packet-filtering rules for interfaces on which routing is being used. The following packet-filtering rules are RIP-specific.

```
# Routing rules (added automatically)
permit  route/udp   FIREWALL            device_INTERFACE
permit  route/udp   device_INTERFACE    FIREWALL
# End of Routing rules
```

See also “Packet-Filtering Rules Window” on page II-22.

Packet-Filtering Rules for Multicast Routing

Packet-filtering rules must be added explicitly in the Packet-Filtering Rules window to allow multicast routing. Any permit rule pertaining to multicast traffic must have the **Validate source address** option on the Basic page of the Packet-Filtering rules window *unchecked* (NO_IF_CHECK option in the **/etc/security/firewall/ng_inet/netguard.conf** file).

In the following examples, end hosts are on the internal network. They can be sources or receivers or both. External interfaces are connected to other multicast routers.

Packet-filtering rules for IGMP control messages

IGMP Queries

The following rules permit IGMP QUERY messages sent out by the firewall to determine group memberships. These rules can be more restrictive by replacing FIREWALL with the internal interface(s) of the firewall (if end hosts exist only on the internal network).

```
# permits general queries
permit  */igmp   FIREWALL   224.0.0.1       NO_IF_CHECK

# permits group-specific queries
permit  */igmp   FIREWALL   multicast-group   NO_IF_CHECK
```

IGMP membership reports:

Subscribers send membership reports to the all-routers group address 224.0.0.2. The following rules permit this traffic. These rules can again be made more restrictive by replacing ALL_INTERNAL with the specific IP addresses of end-hosts.

```
# permits general reports
permit  */igmp   ALL_INTERNAL   224.0.0.2       NO_IF_CHECK

# permits group-specific reports
permit  */igmp   ALL_INTERNAL   multicast-group  NO_IF_CHECK
```

Packet-filtering rules for DVMRP control messages

DVMRP probes/reports

The following rule permits outbound DVMRP control packets (probes and reports) originating from the external interface of the firewall and inbound traffic from neighboring routers:

```
permit   */igmp    ALL_EXTERNAL     224.0.0.4   NO_IF_CHECK
```

If the IP address of the neighboring router(s) are known, the above rule can be replaced with the following:

```
# outbound rule
permit */igmp  firewall_external_interface     224.0.0.4   NO_IF_CHECK

# inbound rule
permit */igmp  IP_address_neighboring_router  224.0.0.4   NO_IF_CHECK
```

DVMRP Prunes / Grafts

The following rules permit DVMRP prunes and grafts:

```
# outbound rule
permit   */igmp   FIREWALL       ALL_EXTERNAL   NO_IF_CHECK

# inbound rule
permit   */igmp   ALL_EXTERNAL   FIREWALL       NO_IF_CHECK
```

If the IP address(es) of neighboring router(s) are known, ALL_EXTERNAL can be replaced with the specific IP addresses.

Packet-filtering rules for data traffic

The following packet-filtering rules permits the end-host as a source:

```
# outbound rule
permit   port/UDP    host-IP         multicast-group  NO_IF_CHECK
```

The following packet-filtering rules permits the end-host as a receiver:

```
# inbound rule
permit   port/UDP    ALL_EXTERNAL    multicast-group   NO_IF_CHECK
```

Tunneling

The following packet-filtering rules permit DVMRP tunnels:

```
permit   */ipencap   FW-endpoint-IP     peer-endpoint-IP   NO_IF_CHECK
permit   */ipencap   peer-endpoint-IP   FW-endpoint-IP     NO_IF_CHECK
```

See also “Packet-Filtering Rules Window” on page II-22.

How to Configure Static Routing

You can use the expanded Static Routes page of the Routing window to specify the default route, which typically is the address of your Internet Service Provider (ISP), and add or change a static routing table entry.

To display the expanded Static Routes page:

1. Select **Configuration** from the Control Panel.
2. Select **Routing**. The Routing window appears.
3. Click on the **Static Routes** tab. The Static Routes page appears.
4. Click on **Show Editor**. The expanded Static Routes page appears.

To add a static route:

1. (Optional) Select the route that you want the new route to follow. (Skip this step if you want to add a new route at the top of the list.)
2. Click on **Insert**. An incomplete new line appears in the list.
3. Type a host name or IP address or a network IP address and sub-network mask in the **Destination** field. It may be a host or network.
4. (Optional) Type a sub-network mask value **Mask** field. The firewall will complete this field based on the **Destination** field, but you may override the supplied mask provided by the firewall as long as the resulting destination and mask combine to form a valid host or network specification.
5. Type a host name or an IP address in the **Forward To** field to indicate the gateway to which to forward packets.
6. (Optional) Type a new route rank in the **Metric** field.
7. Click on **Save**. Your changes take effect at the next system reboot.

Note: When routes have been saved, click on **Use** only if there are no active network connections; your changes take effect immediately. Otherwise, select **System** from the Control Panel, select **System Shutdown**, and click on either **Reinitialize Network** or **Shutdown System and Reboot**.

See also “Packet-Filtering Rules Window” on page II-22.

How to Configure Dynamic Routing

You can use the Dynamic Routes page of the Routing window to configure routing using the gated daemon. You can create your own routing configuration file or use one of several templates as a guide.

To display the Dynamic Routes page:

1. Select **Configuration** from the Control Panel.
2. Select **Routing**. The Routing window appears.
3. Click on the **Dynamic Routes** tab. The Dynamic Routes page appears.

To configure dynamic routes:

1. Edit the current configuration or click on **Load** and select another routing configuration file or template.
2. Use the editor portion of the screen to edit the configuration file.
3. Click on **Save As** and save your file under a new name if you wish to save an alternate configuration for later use, or save what you have as a template.
4. Click on **Save**. Your changes take effect at the next system reboot.

Note: When routes have been saved, click on **Use** only if there are no active network connections; your changes take effect immediately. Otherwise, Select **System** from the Control Panel, select **System Shutdown**, and click on either **Reinitialize Network** or **Shutdown System and Reboot**.

See also "Packet-Filtering Rules Window" on page II-22.

How to Configure Multicast Routing

You can use the expanded Multicast Routes page of the Routing window to enable multicast routing, to limit the scope of multicasting, or to configure DVMRP tunnels.

To display the Multicast Routes page:

1. Select **Configuration** from the Control Panel.
2. Select **Routing**. The Routing window appears.
3. Click on the **Multicast Routes** tab. The Multicast Routes page appears.

To configure multicast routes:

1. Click on **Run multicast routing daemon (mrouted)**.
2. Click on **Use**. Your changes take effect immediately.

This instruction explains the simplest configuration for multicast routing. The **mrouted** defaults are usually adequate for basic routing. Left in its default state, **mrouted** will query on all capable interfaces. Generally, the goal of editing **mrouted.conf** (manually or by using the Multicast Routes page of the Graphical User Interface) is to limit the scope of multicasting (by limiting the number of interfaces mrouted queries or to limit the scope of group addresses that can be used), or to configure DVMRP tunnels. Use the Defaults, Boundary Names, Interfaces, or DVMRP Tunnels pages to make such changes.

You must also add packet-filtering rules using the Packet-Filtering Rules window as described in "Packet-Filtering Rules for Multicast Routing" on page II-104 and "Packet-Filtering Rules Window" on page II-22.

Routing - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

To configure network routing:

1. Define the network routing service in the **/etc/inet/services** file:

   ```
   route   520/udp
   ```

2. Define static and default routes in the **/etc/security/firewall/routes.conf** file.

3. Define dynamic routes in the **/etc/security/firewall/gated.conf** file.

4. Allow dynamic routing through the firewall by adding packet-filtering rules to the **/etc/security/firewall/ng_inet/netguard.conf** file. You will need the following two rules for each interface (for example, dec0, dec1) with RIP enabled:

   ```
   permit     route/udp     FIREWALL          interface_NETWORK
   permit     route/udp     interface_NETWORK FIREWALL
   ```

5. (Optional) To enable dynamic routing, enable the **gated** routing daemon by changing the **ROUTING=** keyword from **false** to **true** in the **/etc/security/firewall/startup.conf** file:

   ```
   ROUTING=true
   ```

6. (Optional) To enable multicast routing, enable the **mrouted** routing daemon by changing the **MROUTED=** keyword from **false** to **true** in the **/etc/security/firewall/startup.conf** file:

   ```
   MROUTED=true
   ```

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Configuration File (netguard.conf)" on page II-43
- **gated(1M)** system manual page
- GateD Consortium Web page: **http://www.merit.edu**
- GateD Consortium e-mail: **consortium-interest@gated.merit.edu**

Static Routing Configuration File (routes.conf)

Use the **/etc/security/firewall/routes.conf** file to configure static routing, including the default route.

Format guidelines:

- Each static route is on a separate line
- Fields are separated by white space (spaces or tabs)
- Comments begin with the # character in the first column and continue until the end of the line

Format:

destination gateway metric group

Fields:

destination — Name or IP address of the *unique* destination host or network. Portable names should begin with an alphanumeric character and must contain only alphanumeric characters and hyphens.

gateway — Gateway through which routing occurs. Must be a host (host name or IP address) on a directly connected network. If a host name is used, it must resolve to an IP address.

metric — Any positive value indicates a gateway route. 0 indicates an interface route, meaning that the *gateway* field must be the IP address of one of the firewall's network interfaces. Because interface routes are automatically established at boot time, you should not have to add any routes with a metric of 0. The range for this field is 0 to 255. This field is required if a *group* is specified.

group — (Optional) If a group name is used for a routing destination, one line is written into this file for each group member. This field contains the group name from which the line originated. Therefore, if a group name is used as the destination in the GUI, this field will contain many lines with the same group name, gateway, and metric, but each with a different *destination*. If the destination is not from a group, this field may be omitted or contain a dash (-).

The following example shows the layout of the **routes.conf** file.

```
# /etc/security/firewall/routes.conf
#
# default route:
default           192.168.1.1       1
#
# host route:
192.168.58.1      192.168.2.2       1
#
# network route:
192.168.0.0/16    192.168.2.1       1
```

Figure II-41. Static Routing Configuration File Example

Note: Separate static routes can be configured to be used on the standby half of an HA pair using the **/etc/security/firewall/routes.standby.conf** file. When the firewall transitions to the standby state, the routes defined in the **routes.standby.conf** file will be installed on the system. If the user does not configure this file, the routes defined in **/etc/security/firewall/routes.conf** will be installed.

The **routes.standby.conf** file enables the firewall to distinguish between the active and standby systems and inject a different default route for each. In some firewall setups, it may also be useful to configure different static routes for the firewall when operating in standby mode.

See also:

- "High Availability" on page I-95
- "Grouping Window" on page II-10

Chapter 7
Split Domain Name System

The Domain Name System (DNS) is a distributed database that maps host names to IP addresses. Services often use DNS because host names (`ftp.uu.net`) are easier to remember than IP addresses (`192.48.96.9`). The servers that map names to addresses are called *domain name servers*.

For networks connected to the Internet, DNS provides a vital service. However, DNS can be used to probe a network and gain useful information about it. To guard against this security threat, the CyberGuard Firewall runs two name servers on the firewall, one name server for the external interfaces and one name server for the internal interfaces. The name server on the external interface contains the public information; the name server on the internal interface contains the private information. The firewall prevents anyone on the outside from talking to the inside name server; only the public information is seen outside the firewall. Packet-filtering rules allow the inside network to talk only to the internal name server and the outside network to talk only to the external name server. This implementation is called *Split Domain Name System* or *Dual Domain Name System*.

Notes:

- If you are unfamiliar with concepts related to the DNS or need further explanation, refer to *DNS and BIND* by Albitz and Liu. This book contains valuable information and is generally consistent with the firewall implementation of DNS.
- A list of DNS-related Requests For Comments (RFCs) appears in the Preface.

Split Domain Name System Window

Use this window to manage two separate name servers. One server works with external or non-trusted interfaces; the other works with internal or trusted interfaces. Each server listens to all interfaces that are on its side of the firewall. This setup prevents external hosts from viewing or breaking into the internal system.

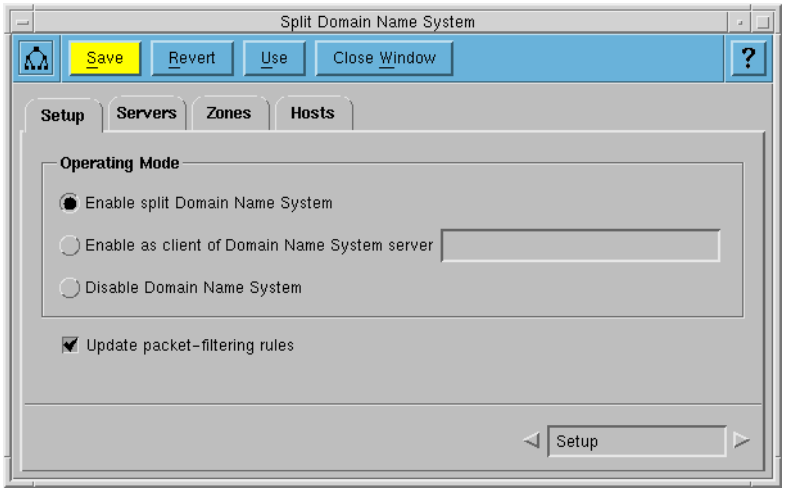


Figure II-42. Split Domain Name System Window - Setup Page

Information about DNS appears on four notebook pages: Setup, Servers, Zones, and Hosts.

See also “Troubleshooting DNS” on page II-147.

DNS Setup Page

Use this page of the Split DNS window to enable DNS and install packet-filtering rules.

This page contains the following field and controls:

Operating Mode
Defines Split DNS operation on the firewall. Provides the following choices:

Enable domain name system
Enables Split DNS. The default is disabled.

Enable as client of Domain Name System server
(Optional) Enables the firewall as a DNS client. Type the IP address (host names are not accepted) of the systems that act as DNS servers for the firewall in the space next to this choice. If this field is left blank, the firewall will direct DNS lookups to hosts as

specified in the **db.cache** file (see "DNS Database Files (db.*)" on page II-132), which identifies well-known DNS servers on the Internet. Note that this is not a typical firewall configuration.

Disable Domain Name System
Disables Split DNS and removes any DNS-specific packet-filtering rules.

Update packet-filtering rules
Automatically installs packet-filtering rules to prevent external hosts from connecting to the internal name server, permit external hosts to connect to the external name server, and permit internal hosts to connect to the internal name server while **Enable domain name system** is checked. Automatically removes these rules while **Disable domain name system** is checked. Checking **Enable domain name system** and not checking this field requires manual editing of rules in the Packet-Filtering Rules window. The default is to automatically update these rules.

CAUTION!

Once you have enabled DNS and automatically installed its packet-filtering rules, do *not* edit the comments that immediately precede and follow these rules, and do not insert *anything* between them.

See also:

- "Window Components" on page I-10
- "Packet-Filtering Rules Window" on page II-22

DNS Servers Page

Use this page of the Split DNS window to define the interfaces on which the DNS servers listen and any forwarders for recursive queries and privileged addresses for zone transfers.

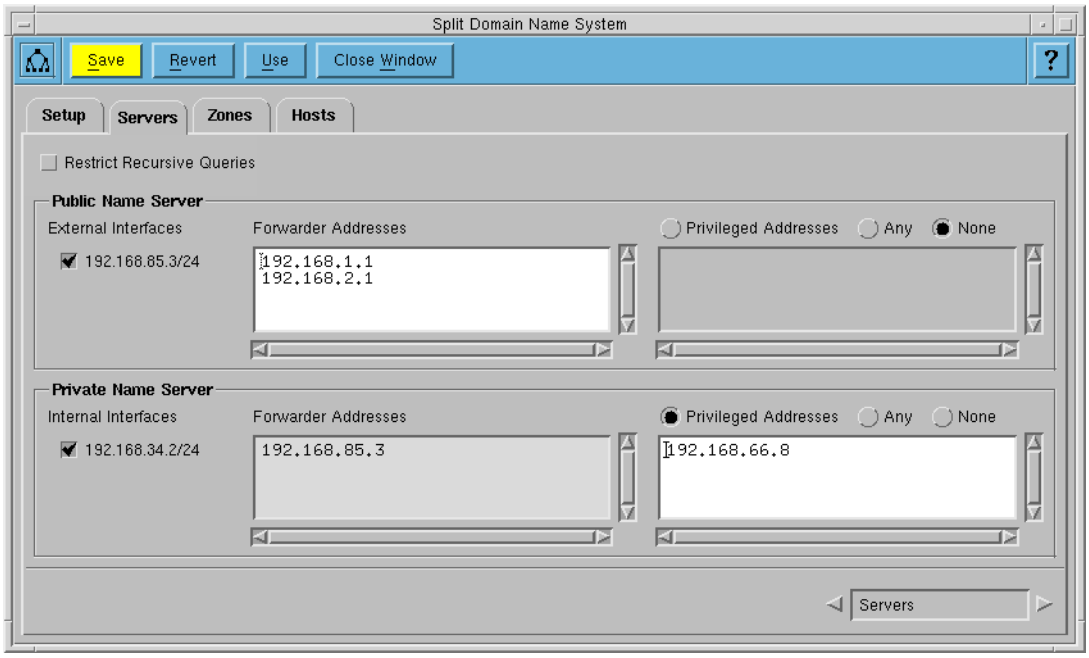


Figure II-43. Split Domain Name System Window - Servers Page

This page is divided into two sections, the Public Name Server section and the Private Name Server section, and contains the following fields and controls:

Restrict Recursive Queries

Restircts recursive queries to the external name server. When this box is unchecked, any host can query the external name server with recursive queries. When this box is checked, only the internal name servers can query the external name server with recursive queries.

Public Name Server

External Interfaces Lists the IP addresses of the external interfaces of the firewall. Check each interface on which the external DNS server will listen.

Forwarder Addresses IP addresses (separated with a space, new line, or carriage return) for the name server to contact if it receives a request for a name outside its authority. This type of request is also known as a recursive query.

Privileged Addresses IP addresses (separated with a space, new line, or carriage return) of hosts and networks that are permitted to make zone transfers.

Any	Allows zone transfers with any host and network.
None	Does not allow zone transfers.

Private Name Server

Internal Interfaces	Lists the IP addresses of the internal interfaces of the firewall. Check each interface on which the internal DNS server will listen.
Forwarder Addresses	IP addresses (separated with a space, new line, or carriage return) for the name server to contact if it receives a request for a name outside its authority. This read-only field shows the external interface address(es) from the Network Interfaces window.
Privileged Addresses	IP addresses (separated with a space, new line, or carriage return) of hosts and networks that are permitted to make zone transfers.
Any	Allows zone transfers with any host and network.
None	Does not allow zone transfers.

Note: You cannot use subnetted IP addresses on the internal side of the firewall if you want to resolve names on the firewall. The **/etc/resolv.conf** file does not allow a classless IP address as the address of the name server.

See also "DNS Resolver Configuration File (resolv.conf)" on page II-138.

DNS Zones Page

Use this page of the Split DNS window to provide the zone name, role, and information sources for the internal and external name servers and to provide connectivity to the Internet for external name servers.

CAUTION!

Do not enter `in-addr.arpa` domains. The CyberGuard Firewall automatically constructs these domains from the host data.

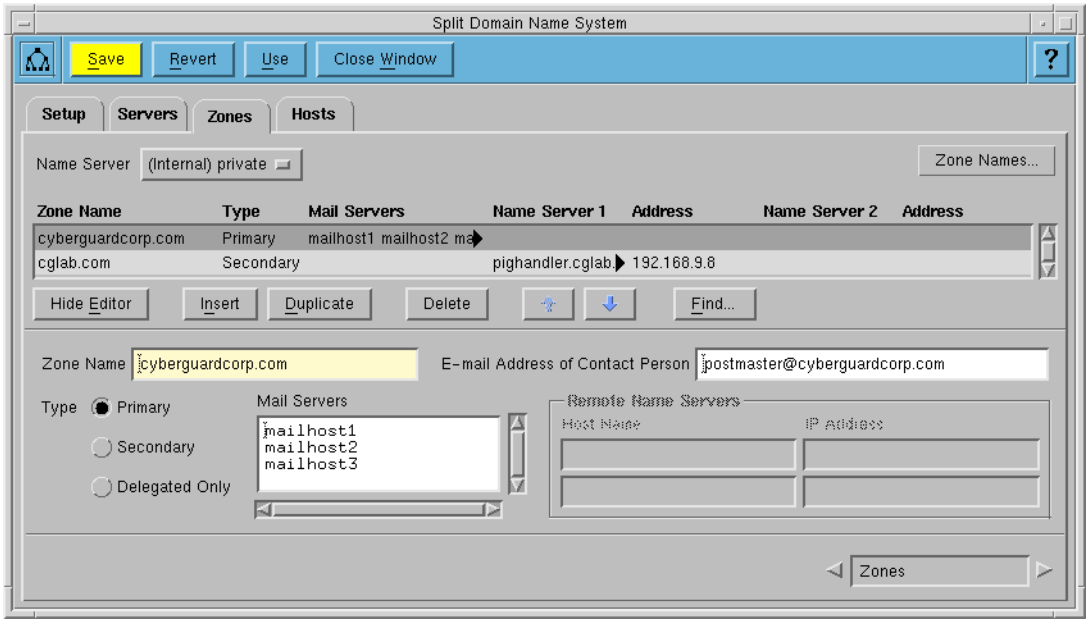


Figure II-44. Split Domain Name System Window - Zones Page (Expanded)

This page contains the following fields:

Name Server Has the following settings:

(Internal) private - Displays zones managed by the internal name server.

(External) public - Displays zones managed by the external name server.

Zone Names Opens a window to allow you to review the network addresses, sub-network masks, and reverse ("in-addr.arpa" domain) zones for the firewall interface you are configuring. If you have entered any classless sub-network masks (something other than 8, 16, or 24), you can use this window to review and correct the constructed hexadecimal sub-network mask values. You can correct any network address and sub-network mask errors on the Hosts page. See "Classless IP Addresses for Split DNS" on page II-121 for more information.

Zone Name For the internal name server, the zone name known to the internal server. For the external name server, the first zone in the list is the registered domain name from the Network Interfaces window; other zones could include a sub-domain such as *mail.company.com*.

Type Has the following settings:

Primary - (Default) Name server reads information about the zone directly from internal database files.

Secondary - Name server gets information about the zone over the network from a *primary* name server specified in one of the **Remote Name Server IP Address** fields.

Delegated Only - Sub-domain managed by a *primary* remote name server. For example, *software.mycompany.com* is a sub-domain of *mycompany.com*. If the registered domain name of the system is **Delegated Only**, forwarders are required for the external name server. If other domains are **Delegated Only** forwarders are optional, but if they are not specified, the domain must be a child of a primary domain.

Mail Servers Mail servers for the primary zones. A mail server may be specified as a simple host name, a fully qualified name, or a domain prefix separated from a simple or fully qualified name with a colon (:). If a specified mail domain name (to the left of a colon) is a simple name, the current domain name is appended to it.

E-mail Address of Contact Person
E-mail address of the person to contact regarding DNS on each zone. The default is `postmaster@`*node_name.domain*.

Remote Name Servers Host Name
(Optional for Secondary; required for Delegated) Host name for the primary name server for the sub-domain. Portable names should begin with an alphanumeric character must contain only alphanumeric characters and hyphens. The default domain name is the appended value of the **Domain Name** field. If you type only the host name without a dot (.), the firewall will automatically append the domain. Do not use underscores in this field.

Remote Name Servers IP Address
(Required for Secondary and Delegated) IP address for the primary name server for the sub-domain.

Notes:

- To specify more than two Remote Name Servers, see "DNS Database Files (db.*)" on page II-132.
- The GUI will always place the registered domain name from the Network Interfaces window first in the external domains list. If the GUI cannot find the registered domain, it will ask if the first domain in the list should be updated to match the registered domain name. If you allow this, the entire system will be updated with this information.

See also "Network Interfaces Window" on page I-68.

DNS Hosts Page

Use this page of the Split DNS window to view and update the list of hosts for each primary domain.

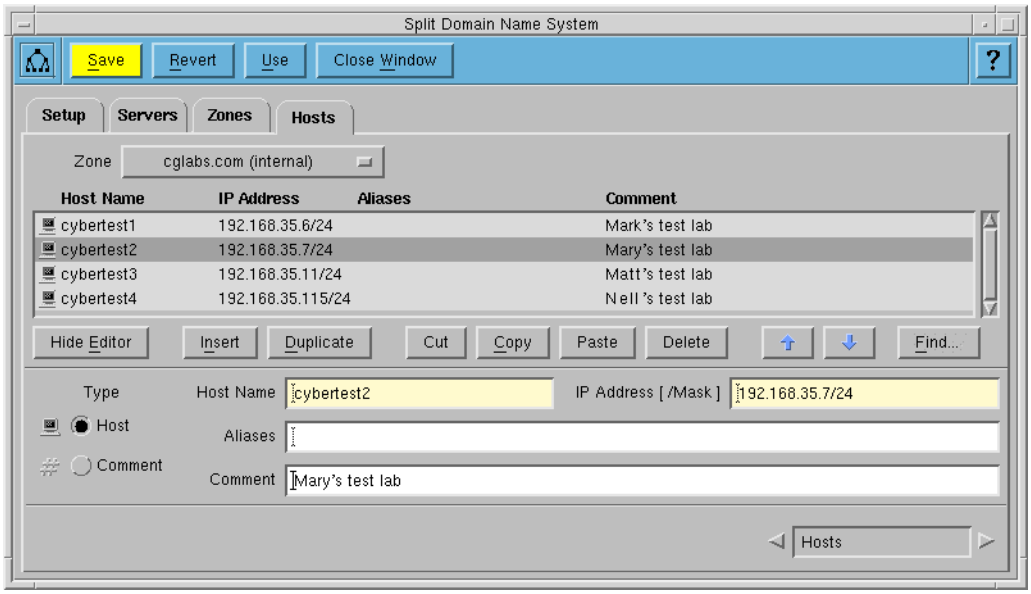


Figure II-45. Split Domain Name System Window - Hosts Page (Expanded)

This page contains the following fields and controls:

Zone (Read-only) Internal or external zones defined on the Zones page. Hosts are grouped within a selected zone.

Type Has the following settings:

Host - Treats this line as a host
Comment - Treats this line as a comment

Host Name Primary name of the host. The first host with an IP address that matches the IP address of one of the firewall interfaces selected on the Servers page will be advertised as the name and address of the authoritative name server. Portable names should begin with an alphanumeric character must contain only alphanumeric characters and hyphens.

IP Address [/Mask]
Address used by the Internet Protocol to communicate with the host. The optional sub-network mask is specified with a slash (/) followed by either a bit count (e.g., /24) or a dotted-quad mask (e.g., 255.255.255.0). The firewall will translate and display all dotted-quad masks in bit-count format. The sub-network mask portion of this field is required if the IP address class is not correct; otherwise, specifying a mask is not required.

If you enter a classless sub-network mask (something other than 8, 16, or 24) and click on **Save**, a window opens to allow you to review the net-

work addresses, sub-network masks, and reverse ("in-addr.arpa" domain) zones for the firewall interface you are configuring. In this pop-up window, you must supply the names to use with each of your classless sub-network addresses. Correct any zone name errors on the Zones page. See "Classless IP Addresses for Split DNS" on page II-121 for more information.

Aliases Secondary names for the host. (An alias can separate a functional name from a host name. For example, you might use *mail* as an alias for a host that processes mail. If you change the host that processes mail, you simply move the alias to the other host.) Portable aliases should begin with an alphanumeric character must contain only alphanumeric characters and hyphens. The aliases are separated by spaces. This field may be blank.

Comment Information about the host, such as its hardware address, or a commented-out host description. This field may be blank.

Notes:

- The Hosts page of the Split DNS window defines host names and makes them available to other hosts on the network. The Host Names window defines host names for use only by the firewall.
- Primary external name servers should specify the name and address of an ISP.

See also:

- "Window Components" on page I-10
- "Network Interfaces Window" on page I-68
- "Host Names Window" on page II-1

Classless IP Addresses for Split DNS

A sub-network mask must be associated with each IP address so that a reverse ("in-addr.arpa" domain) zone can be constructed. The CyberGuard Firewall permits the use of sub-network mask suffixes on IP addresses entered on the Hosts page of the Split Domain Name System page.

Classful Sub-Network Masks

The user may specify `172.16.48.5/24` to indicate host address `5` on network `172.16.48`. Without the explicit sub-network mask (`/24`), the Domain Name System would interpret `172.16.48.5` as host address `48.5` on class B network `172.16`.

The IP address `172.16.48.5/24` is called a *classful network IP address*. A classful network IP address is one in which the sub-network stops on an eight-bit boundary; its sub-network mask is one of 8, 16, or 24 (expressed in bit-count format) or 255.0.0.0, 255.255.0.0, or 255.255.255.0 (expressed in dotted-quad format).

The reverse in-addr.arpa domain for the IP address `172.16.48.5/24` is represented as `48.16.172.in-addr.arpa`. The sub-network mask can be assumed by the number of

octets in the domain name. For example, a reverse in-addr.arpa domain represented as `48.16.172.in-addr.arpa`. implies a sub-network mask `255.255.255.0`; a reverse in-addr.arpa domain represented as `16.172.in-addr.arpa`. implies a sub-network mask `255.255.0.0` (it need not be the default for the address class).

Classless Sub-Network Masks

You can also use a sub-network mask with a non-octet boundary, for example `172.16.48.192/28`. This is called a *classless network IP address*. A classless network IP address is one in which the network mask does not stop on an eight-bit boundary; its sub-network mask is not one of 8, 16, or 24 (expressed in bit-count format) or 255.0.0.0, 255.255.0.0, or 255.255.255.0 (expressed in dotted-quad format). The typical dotted-quad form of a classless IP address includes one octet that represents part of the network mask and all or part of the host bits.

If you enter a classless sub-network mask (something other than 8, 16, or 24) on the Hosts page of the Split DNS window and click on **Save**, a window opens displaying the network addresses, sub-network masks, and reverse ("in-addr.arpa" domain) zones for the firewall you are configuring. More importantly, this window displays the current zone name for your classless IP address. If you have not changed your zone name, the default zone constructed for your classless IP address is displayed.

The leading component of the default zone, constructed by the firewall, represents the decimal value of the part of the right-most octet that has some network bits set, followed by the hexadecimal mask for that octet. For example, consider host address `172.16.195.1/20`. The network portion comprises the first 20 bits of the address. Expressed as a dotted quad value, using hexadecimal, the first 20 bits is `0xff.0xff.0xf0.0x00`. That means that the network address portion ends in the middle of the third octet (195). If we ignore the low four bits of `195` (hexadecimal `0xc3`), the portion that is part of the host address, we are left with `192` (hexadecimal `0xc0`). That means that the network address is `172.16.192.0/20`, and the host address on that network is 3.1.

Non-octet sub-network boundaries are usually used only for delegated sub-domains. When the firewall constructs a zone name, if the last meaningful octet of the network address is split between network and host portions (i.e., classless) then that octet's value and the mask are encoded by combining the decimal value with the hexadecimal mask. In this case, the third octet is encoded as `192xf0` and the default reverse in-addr.arpa domain is `192xf0.16.172.in-addr.arpa`.

However, there is no standard for creating zone names for classless addresses. The zone name you use with DNS on the firewall must agree with whatever name is used by your parent domain in its **db.domain** file. Consequently, you may specify a translation between the default name of a classless network and the name used by your parent domain. Only the first component is variable, and only if the network is classless. The only requirement is that the value may not be completely numeric. You must contact the network administrator of your upstream DNS server for this information.

If the CyberGuard Firewall detects an unrecognized zone name representing a classless network IP address, a window opens, requesting the octet that is split by the end of the network mask and the sub-network prefix count (total number of bits in the network mask). Be sure the resulting network address that you create does not have any host bits set. For example, if zone name `kirk.2.198` has been used for the `192.2.96.0/20` network, you need to enter `96` for the missing network address octet and `20` for the sub-network mask

prefix bit count. (This information is saved in the **zonemap** file. See "Classless IP Addresses Database File (zonemap)" on page II-139).

The network address octet value must be between 0 and 254, and the sub-network prefix count must be between 2 and 31.

Note: You cannot use subnetted IP addresses on the internal side of the firewall if you want to resolve names on the firewall. The **/etc/resolv.conf** file does not allow a classless IP address as the address of the name server.

See also:

- "Network Interfaces" on page I-65
- "Static Routes Page" on page II-83
- "DNS Resolver Configuration File (resolv.conf)" on page II-138

Packet-Filtering Rules for Split DNS

The GUI automatically adds packet-filtering rules for Split DNS to the Packet-Filtering Rules window.

When Split DNS is enabled, the following rules prohibit external hosts from communicating with the firewall's internal name server, allow external hosts to talk to the external name server, and allow internal hosts to talk to the internal name server:

```
# Split DNS rules (added automatically by the CyberGuard GUI)
permit domain/tcp ALL_EXTERNAL  EXTERNAL_INTERFACES
permit domain/tcp EXTERNAL_INTERFACES  ALL_EXTERNAL
permit domain/udp ALL_EXTERNAL  EXTERNAL_INTERFACES  ENABLE_REPLY
permit domain/udp EXTERNAL_INTERFACES  ALL_EXTERNAL  ENABLE_REPLY
permit domain/tcp ALL_INTERNAL  INTERNAL_INTERFACES
permit domain/tcp INTERNAL_INTERFACES  ALL_INTERNAL
permit domain/udp ALL_INTERNAL  INTERNAL_INTERFACES  ENABLE_REPLY
permit domain/udp INTERNAL_INTERFACES  ALL_INTERNAL  ENABLE_REPLY
deny   domain/tcp EVERYONE EVERYONE
deny   domain/udp EVERYONE EVERYONE
# End of Split DNS rules
```

When the firewall is configured as a client of another DNS, the following rules are added:

```
# Split DNS rules (added automatically by the CyberGuard GUI)
permit domain/tcp  nameserver   FIREWALL
permit domain/tcp  FIREWALL     nameserver
permit domain/udp  nameserver   FIREWALL     ENABLE_REPLY
permit domain/udp  FIREWALL     nameserver   ENABLE_REPLY
# End of Split DNS rules
```

See also "Packet-Filtering Rules Window" on page II-22.

How to Configure Split DNS on the Firewall

Use the Split DNS window to protect internal names and IP addresses by configuring two Domain Name System servers, one for the external interfaces and one for the internal interfaces.

To enable Split DNS on the firewall:

1. Select **Configuration** from the Control Panel.
2. Select **Split Domain Name System**. The Split Domain Name System window appears displaying the Setup page.
3. Select **Enable split Domain Name System**.
4. Select **Update packet-filtering rules**.

To configure the public and private name servers:

1. Click on the **Servers** tab. The Servers page appears.
2. Configure the public name server:
3. Check each external firewall interface on which the external DNS server will listen.
4. Type IP addresses for the name server to contact if it receives a request for a name outside its authority in the **Forwarder Addresses** field.
5. Configure the zone transfer policy using **Privileged Addresses**, **Any**, or **None**.
6. Configure the private name server:
7. Check each internal firewall interface on which the internal DNS server will listen.
8. Configure the zone transfer policy using **Privileged Addresses**, **Any**, or **None**.

To configure internal and external zones:

1. Click on the **Zones** tab. The Zones page appears.
2. Click on **Show Editor**. The expanded Zones page appears.
3. Select **(Internal) private** or **(External) public** in the **Name Server** field to display information for the proper name server.
4. (Optional) Select the zone that you want the new zone to follow. (Skip this step if you want to add a new zone at the top of the list.)
5. Click on **Insert**. An incomplete new line appears in the list. The **Type** field is set to **Primary**.
6. Type a zone name in the **Zone Name** field.
7. Select **Primary**, **Secondary**, or **Delegated Only** in the **Type** field.
8. (Optional) Type an e-mail address in the **E-mail Address of Contact Person** field
9. (Optional) Type the Mail Server name in the **Mail Servers** field.

10. (For Secondary and Delegated Only) Type the host name of a name server in the **Remote Name Server Host Name** field. Type the IP address in the **Remote Name Server IP Address** field. One or two name servers are allowed. Enter at least one name if Delegated Only. Enter at least one IP address for either Delegated Only or secondary.

11. Repeat these steps for all the other zones.

To configure hosts:

1. Click on the **Hosts** tab. The Hosts page appears.
2. Select the zone that these hosts should belong to.
3. Click on **Show Editor**. The expanded Hosts page appears.
4. (Optional) Select the host that you want the new host to follow. (Skip this step if you want to add a new host at the top of the list.)
5. Click on **Insert**. An incomplete new line appears in the list. The **Type** field is set to **Host**.
6. Select **Host** in the **Type** field.
7. Type a host name in the **Host Name** field.
8. Type the IP address and sub-network mask in the **IP Address [/Mask]** field.
9. (Optional) Type a space-separated list of aliases in the **Aliases** field.
10. (Optional) Type a comment in the **Comment** field.
11. Repeat these steps for other hosts.

To complete DNS configuration:

1. Click on **Save**. Your changes take effect at the next system reboot.
2. (Optional) Click on **Use**. Your changes take effect immediately.
3. Ensure that appropriate DNS packet-filtering rules exist in the Packet-Filtering Rules window.

See also “Packet-Filtering Rules Window” on page II-22.

Split DNS - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

The examples in this section use a fictitious domain called `storm.com`. The firewall is `typhoon.storm.com`. The following figure shows the domain name space for `storm.com`. The shaded portion shows the domain for which the name servers are responsible. Figure II-47 shows the layout of `storm.com`.

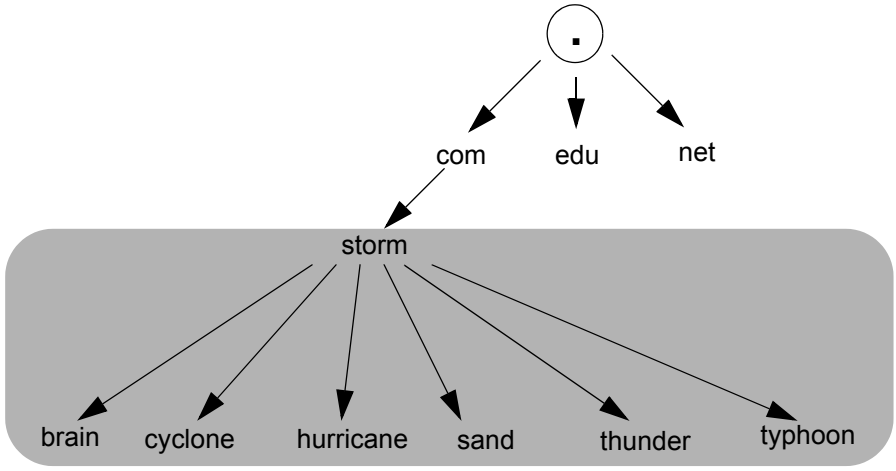


Figure II-46. Name Tree of storm.com Domain

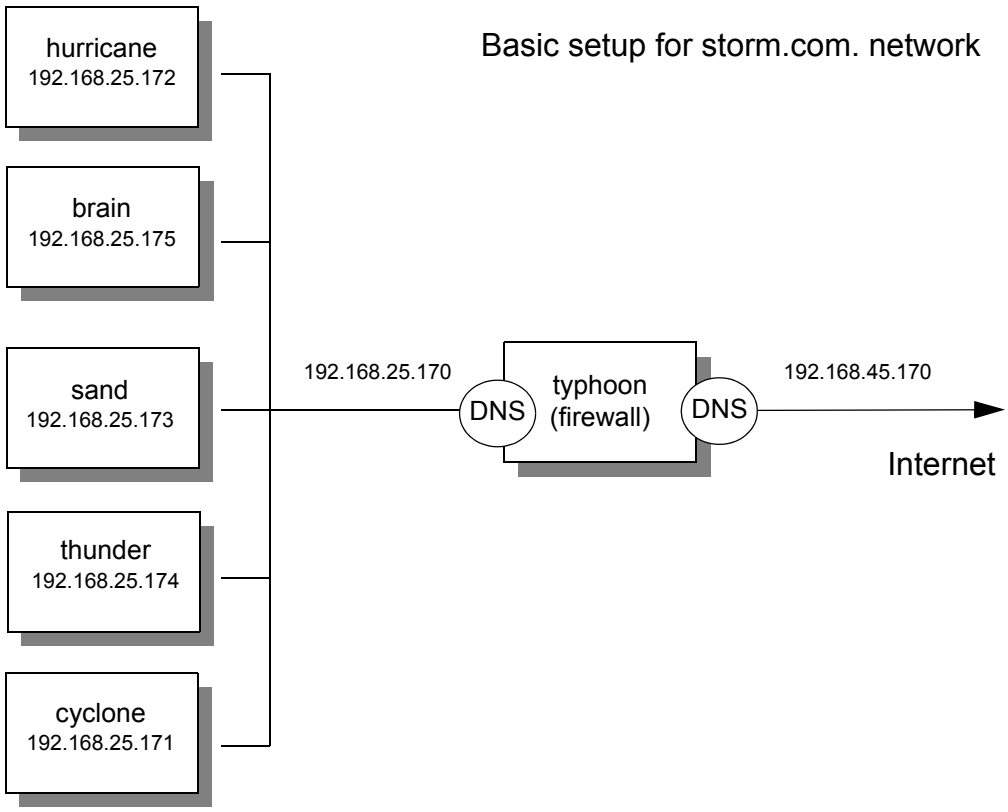


Figure II-47. Two Name Servers Running on the Firewall

To configure Split DNS on the firewall:

1. Determine the IP addresses of the external and internal interfaces.

   ```
   netstat -in
   ```

2. Define DNS in the **/etc/inet/services** file:

   ```
   domain 53/tcp
   domain 53/udp
   ```

3. Define packet-filtering rules in the **/etc/security/firewall/ng_inet/netguard.conf** file, similar to the following example. Deny external hosts the ability to talk to the firewall's internal name server. Allow external hosts to talk to the external name server. Allow internal hosts to talk to the internal name server.

```
#action service/proto from         to             options
#allow traffic outside to external interface name server
permit domain/tcp all_external    =192.168.45.170
permit domain/tcp =192.168.45.170 all_external
permit domain/udp all_external    =192.168.45.170 enable_reply
permit domain/udp =192.168.45.170 all_external    enable_reply
#
#allow traffic inside to internal interface name server
permit domain/tcp all_internal    =192.168.25.170
permit domain/tcp =192.168.25.170 all_internal
permit domain/udp all_internal    =192.168.25.170 enable_reply
permit domain/udp =192.168.25.170 all_internal    enable_reply
#
# Deny all other traffic
deny   domain/tcp  EVERYONE        EVERYONE
deny   domain/udp  EVERYONE        EVERYONE
```

4. Configure the DNS-specific files associated with the external interface:
   - External boot file:
     /etc/security/firewall/DNS/EXTERNAL/public/bootfile
   - External database files:
     /etc/security/firewall/DNS/EXTERNAL/public/db.*
5. Configure the DNS-specific files associated with the internal interface:
   - Internal boot file:
     /etc/security/firewall/DNS/INTERNAL/private/bootfile
   - Internal database files:
     /etc/security/firewall/DNS/INTERNAL/private/db.*
6. Configure resolvers in the **/etc/resolv.conf** to ensure that all internal hosts query the correct name server.
7. Modify the **/etc/netconfig** file to specify when DNS is used for name-to-address lookups.
8. Enable DNS in the **/etc/security/firewall/startup.conf** file by adding a valid domain name after the **DOMAIN=** keyword:

```
DOMAIN=valid_domain_name
```

Note: Only a privileged user can configure split DNS on the firewall.

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Configuration File (netguard.conf)" on page II-43
- "DNS Boot File (bootfile)" on page II-129
- "DNS Database Files (db.*)" on page II-132
- "DNS Resolver Configuration File (resolv.conf)" on page II-138
- "Network Configuration Database File (netconfig)" on page II-138

DNS Boot File (bootfile)

Use the boot file to define where the name server is to get its initial data.

Format guidelines:

- Lines can be blank, comments, or statements
- Comments begin with a semi-colon (;) and continue until the end of the line
- Each statement begins on a new line and cannot continue on subsequent lines
- Domain names must not contain a trailing dot (.)

Format:

keyword value

Statements:

directory *path_name*
Directory where the files listed in the boot file reside.

cache *file*
Contains the initial records for the cache and tells where the root servers are. More than one cache file can be specified.

nocache
Indicates that the name server should be non-caching. This restricts the name server from caching the address of other name servers to query. Thus, the name server will not make queries directly to the outside but will query the forwarders instead.

interface *IP_addresses*
Specify which interface the DNS server will listen to. To listen on multiple interfaces, use this statement multiple times.

primary *domain file*
Indicates that this is the **primary** name server for *domain*. *file* contains the records for the domain. One or more primary statements can be specified.

secondary *domain IP_addresses file*
Indicates that this is the **secondary** name server for *domain*. A *secondary name server* is a name server that must occasionally poll a (usually primary) name server to get up-to-date information about its domain. *IP_addresses* is one or more name servers to contact for more current records of *domain*. *file* contains the initial records for the *domain*.

forwarders *IP_addresses*
Provides a list of one or more *IP_addresses* that the name server should contact when a query is received for a name outside its authority.

slave
Forces the name server to make queries only to forwarders. This option is normally used on machines that will run a server, cannot be given Internet access, and have access to a host with Internet access.

xfrnets *IP_addresses*
Provides a list of one or more *IP_addresses* from which zone transfer requests are accepted.

recursives *internal_address*
This keyword is optional and appears only in the external name server boot file. This keyword restricts recursive queries to the external name server. When this keyword is present, only the internal name servers can query the external name server with recursive queries. One **recursives** *internal_address* statement must be present for each internal name server. When this keyword is not present, any host can query the external name server with recursive queries.

Note: If the firewall is enabled as a DNS client, the **forwarders** directive is omitted from the **boot** file. Instead, the **cache** directive is used (instead of **nocache**) when in client mode and the forwarders list is empty.

External Name Server Boot File Example

The following example shows the boot file for the external name server for the `storm.com.` domain.

```
; /etc/security/firewall/DNS/EXTERNAL/public/bootfile
; EXTERNAL Name Server Boot File
;
directory     /etc/security/firewall/DNS/EXTERNAL/public
cache         .                              db.cache
primary       storm.com                      db.storm
primary       45.168.192.in-addr.arpa        db.192.168.45
primary       0.0.127.in-addr.arpa           db.127.0.0
interface     192.168.45.170
```

Figure II-48. Boot File Example for External Name Server

The `directory` line shows that `db.storm`, `db.192.168.45`, `db.127.0.0`, and `db.cache`, which appear in the directives that follow, are under the `/etc/security/firewall/DNS/EXTERNAL/public` directory.

The first `primary` line shows that the external name server is a primary name server for the domain `storm.com.` The file `db.storm` contains resource records that are the database records for the `storm.com.` domain.

The next `primary` line shows that the external name server is a primary name server for the domain `45.168.192.in-addr.arpa`. The `45.168.192.in-addr.arpa.` domain represents the network `192.168.45`. The `in-addr.arpa.` domain is used to resolve IP addresses to names. Since the external interface's address belongs to the `192.168.45` network, it is a name server for the `45.168.192.in-addr.arpa.` domain. Your Internet Service Provider may be responsible for the IP address of the external interface and therefore, responsible for this domain. If this is the case, remove this line and ignore any references to the `45.168.192.in-addr.arpa.` domain.

The third `primary` line shows the `0.0.127.in-addr.arpa.` domain information, which may not be necessary but is here for completeness. Most UNIX machines have a loopback interface called `localhost` with an IP address of `127.0.0.1`. By having a resource record in `storm.com.` for `localhost` and adding the `0.0.127.in-addr.arpa.` domain, queries for `localhost` will be answered by the external name server.

The `cache` line is responsible for the root domain (`.`), which contains records of all root name servers.

Internal Name Server Boot File Example

The internal name server must be dependent on the external name server. Indicate this in the boot file, as shown in the following example of the boot file for the internal name server for the `storm.com.` domain.

```
; /etc/security/firewall/DNS/INTERNAL/private/bootfile
; INTERNAL Name Server Boot File
;
directory       /etc/security/firewall/DNS/INTERNAL/private
cache           .                               db.cache
interface       192.168.25.170
primary         storm.com                       db.storm
primary         25.168.192.in-addr.arpa         db.192.168.25
primary         0.0.127.in-addr.arpa            db.127.0.0
forwarders      192.168.45.170    192.168.45.170    192.168.45.170
slave
```

Figure II-49. Boot File Example for Internal Name Server

This file is similar to the external name server's boot file. The name server must still be responsible for the `storm.com.` and the `0.0.127.in-addr.arpa.` domains. The `25.168.192.in-addr.arpa.` domain is different from the `45.168.192.in-addr.arpa.` domain because the network numbers for the interfaces are different.

The `forwarders` line tells the name server to forward outside queries first to the name servers running on the `192.168.45.170` domain before attempting to resolve the query itself. The `slave` line tells the name server to rely on its forwarders list and not attempt to resolve the query itself. `192.168.45.170` is listed three times so the internal name server will retransmit queries three times before giving up. The internal name server is configured to handle forwards in this way so it can resolve outside names without having to talk to name servers on the Internet. If traffic were allowed to the internal name server, it would reveal private information about the network.

DNS Database Files (db.*)

Database files contain resource records for each domain listed on a primary line in the boot file of a name server. The cache file contains resource records for all known root servers.

Format guidelines:

- Lines can be blank, comments, or statements
- Comments begin with a semi-colon (;) and continue until the end of the line
- Each statement begins on a new line, and only the SOA record can span multiple lines

Format:

domain [*ttl*] *class record_type resource_record_data*

Fields:

domain Standard domain name, **.** for root server, or **@** for the current origin.

ttl (Optional) Resource record's time to live.

class Object address type. Use **IN** (Internet).

record_type resource_record_data
This field consists of the record type and the associated information:

A *address* - Host address.
CNAME *domain* - Canonical name for an alias.
HINFO *cpu_type OS_type* - Host information.
MB *domain* - Mailbox domain name.
MG *domain* - Mail group member.
MINFO *request_domain error_domain* - Mailbox or mail list information.
MR *domain* - Mail rename domain name.
MX *domain* - Mail exchange. Indicates the host that can forward e-mail.
NS *domain* - Authoritative name server.
NULL - Null resource record. No format or data.
PTR *domain* - Domain name pointer. Maps IP addresses to names.
SOA *SOA_data* - Start of Authority record. Marks the start of a zone of authority. Each master zone file should begin with an SOA record for the zone. Indicates which name server has authoritative data for the domain and who is the administrative contact person. The SOA record is one of the few record types that is allowed to span more than one line; use parenthesis, as in the examples that follow. SOA records include the following:

domain_orig_host - Domain of originating host.

domain_address_of_maintainer - Domain address of maintainer.

serial_number - Typically a date and a version. Increasing this number tells

secondary servers to update their data. This number should be changed each time the master file is changed.

refresh - Indicates in seconds how often a secondary name server should refresh its database.

retry - Indicates how many seconds after a failed refresh a secondary name server should wait until trying again.

expire - Indicates the maximum time in seconds the secondary name server can claim its data authoritative. If it cannot refresh its data in this amount of time, the name server must expire.

time_to_live - Indicates how many seconds the data received from this name server can be cached by another name server.

External Name Server Database File Examples

The information for the `storm.com.` domain should include the firewall and the mail relay (also can be the firewall). The *mail relay* is a host that can forward e-mail for users on a system. Figure II-50 shows the resource records for the `storm.com.` domain.

```
;/etc/security/firewall/DNS/EXTERNAL/public/db.storm
;
; Information available to outside for names matching
; pattern *.storm.com or the storm.com zone.
;
storm.com. IN SOA typhoon.storm.com. sysadm.storm.com. (
        1995101601   ; serial number
        10800        ; refresh
        3600         ; retry
        86400        ; expire
        86400        ; time to live
)
;
storm.com.              IN NS          typhoon.storm.com.
;
typhoon.storm.com.      IN A           192.168.45.170
;
; Mail support
*.mail.storm.com.       IN MX   0      typhoon.storm.com.
*.storm.com.            IN MX   0      typhoon.storm.com.
```

Figure II-50. External Database File Example for the storm.com. Domain

The `SOA` record shows that `typhoon.storm.com.` has authoritative data for `storm.com.` The administrative contact is `sysadm@storm.com.` Note the parenthesis, which allows the SOA record to span more than one line. The serial number represents October 16th, 1995, version 1. The refresh number indicates that a secondary should refresh its database every 10,800 seconds. The retry number indicates that after a failed refresh, a secondary name server should 3,600 seconds before trying again. The expire number indicates that the secondary name server has a maximum of 86,400 seconds to claim that its data is

authoritative. The time-to-live number indicates that the data received from this name server has 86,400 seconds to be cached by another name server.

The NS record shows that a name server for storm.com. is typhoon. The A records show that typhoon's address is 192.168.45.170 and that localhost's address is 127.0.0.1. The MX records show that names matching *.mail.storm.com. or *.storm.com. should be sent to typhoon. All mail in this setup will be routed to the firewall; the SMTP server must be able to correctly route mail to the correct host.

Figure II-51 shows the resource records for the 45.168.192.in-addr.arpa.domain.

```
;/etc/security/firewall/DNS/EXTERNAL/public/db.192.168.45
;
45.168.192.in-addr.arpa. IN SOA  typhoon.storm.com.  sysadm.storm.com. (
        1995101601    ; serial number
        10800         ; refresh
        3600          ; retry
        86400         ; expire
        86400         ; time to live
)
;
45.168.192.in-addr.arpa.        IN NS   typhoon.storm.com.
;
170.45.168.192.in-addr.arpa.    IN PTR  typhoon.storm.com.
```

Figure II-51. Database File Example for 45.168.192.in-addr.arpa. Domain

The SOA record shows that typhoon has authoritative data. The NS record shows that typhoon is the name server for the 45.168.192.in-addr.arpa. domain. The PTR record shows that address 192.168.45.170 belongs to typhoon.

Figure II-52 shows the resource records for the 0.0.127.in-addr.arpa. domain in **/etc/security/firewall/DNS/EXTERNAL/public/db.127.0.0** file.

```
;/etc/security/firewall/DNS/EXTERNAL/public/db.127.0.0
;
0.0.127.in-addr.arpa.  IN SOA  typhoon.storm.com.  sysadm.storm.com. (
        1995101601    ; serial number
        10800         ; refresh
        3600          ; retry
        86400         ; expire
        86400         ; time to live
)

0.0.127.in-addr.arpa.   IN NS   typhoon.storm.com

1.0.0.127.in-addr.arpa. IN PTR  localhost.
```

Figure II-52. Database File Example for 0.0.127.in-addr.arpa. Domain

As you can see, `localhost` is the only machine in this domain.

Figure II-53 shows the resource record for the cache file.

```
; /etc/security/firewall/DNS/EXTERNAL/public/db.cache
;
.                       3600000  IN  NS    A.ROOT-SERVERS.NET.
A.ROOT-SERVERS.NET.     3600000      A     198.41.0.4
.                       3600000      NS    B.ROOT-SERVERS.NET.
B.ROOT-SERVERS.NET.     3600000      A     128.9.0.107
.                       3600000      NS    C.ROOT-SERVERS.NET.
C.ROOT-SERVERS.NET.     3600000      A     192.33.4.12
.                       3600000      NS    D.ROOT-SERVERS.NET.
D.ROOT-SERVERS.NET.     3600000      A     128.8.10.90
.                       3600000      NS    E.ROOT-SERVERS.NET.
E.ROOT-SERVERS.NET.     3600000      A     192.203.230.10
.                       3600000      NS    F.ROOT-SERVERS.NET.
F.ROOT-SERVERS.NET.     3600000      A     192.5.5.241
.                       3600000      NS    G.ROOT-SERVERS.NET.
G.ROOT-SERVERS.NET.     3600000      A     192.112.36.4
.                       3600000      NS    H.ROOT-SERVERS.NET.
H.ROOT-SERVERS.NET.     3600000      A     128.63.2.53
.                       3600000      NS    I.ROOT-SERVERS.NET.
I.ROOT-SERVERS.NET.     3600000      A     192.36.148.17
```

Figure II-53. Cache File Example for External Name Server

The cache file contains the list of all known root servers. The number `3600000` is the time-to-live in seconds for the data. In this example, the root servers will not change for 1,000 hours.

Internal Name Server Database File Examples

For your internal domain, you must have address records and pointer records for each inside host. If you want to use DNS to route mail, you also will need `MX` records. The files **db.cache** and **db.127.0.0** do not change from public to private.

The following example shows the database file for the `storm.com.` domain.

```
; /etc/security/firewall/DNS/INTERNAL/private/db.storm

storm.com. IN SOA typhoon.storm.com. sysadm.storm.com. (
        1995101601       ; serial number
        10800   ; refresh
        3600    ; retry
        86400   ; expire
        86400   ; time to live
)

storm.com.              IN NS   typhoon.storm.com.

typhoon.storm.com.      IN A    192.168.25.170
cyclone.storm.com.      IN A    192.168.25.171
hurricane.storm.com.    IN A    192.168.25.172
sand.storm.com.         IN A    192.168.25.173
thunder.storm.com.      IN A    192.168.25.174
brain.storm.com.        IN A    192.168.25.175
```

Figure II-54. Internal Database File Example for the storm.com. Domain

The address records belong in this file. `MX` records also would be listed in this file as well as other record types such as well-known services (WKS) or host information (HINFO). These additional record types provide ways of telling more information about a domain or host.

Figure II-55 shows the SOA and pointer records for the `in-addr.arpa.` domain.

```
; /etc/security/firewall/DNS/INTERNAL/private/db.192.168.25
;
25.168.192.in-addr.arpa. IN SOA  typhoon.storm.com.  sysadm.storm.com.  (
        1995101601   ; serial number
        10800        ; refresh
        3600         ; retry
        86400        ; expire
        86400        ; time to live
)
;
25.168.192.in-addr.arpa.       IN NS   typhoon.storm.com.
;
170.25.168.192.in-addr.arpa.   IN PTR  typhoon.storm.com.
171.25.168.192.in-addr.arpa.   IN PTR  cyclone.storm.com.
172.25.168.192.in-addr.arpa.   IN PTR  hurricane.storm.com.
173.25.168.192.in-addr.arpa.   IN PTR  sand.storm.com.
174.25.168.192.in-addr.arpa.   IN PTR  thunder.storm.com.
175.25.168.192.in-addr.arpa.   IN PTR  brain.storm.com.
```

Figure II-55. Database File Example for 25.168.129.in-addr.arpa. Domain

The **db.cache** and **db.127.0.0** files are the same for the internal name server as for the external name server.

Figure II-56 shows the internal **db.cache**.

```
; /etc/security/firewall/DNS/INTERNAL/private/db.cache
;
.                       3600000  IN  NS    A.ROOT-SERVERS.NET.
A.ROOT-SERVERS.NET.     3600000      A     198.41.0.4
.                       3600000      NS    B.ROOT-SERVERS.NET.
B.ROOT-SERVERS.NET.     3600000      A     128.9.0.107
.                       3600000      NS    C.ROOT-SERVERS.NET.
C.ROOT-SERVERS.NET.     3600000      A     192.33.4.12
.                       3600000      NS    D.ROOT-SERVERS.NET.
D.ROOT-SERVERS.NET.     3600000      A     128.8.10.90
.                       3600000      NS    E.ROOT-SERVERS.NET.
E.ROOT-SERVERS.NET.     3600000      A     192.203.230.10
.                       3600000      NS    F.ROOT-SERVERS.NET.
F.ROOT-SERVERS.NET.     3600000      A     192.5.5.241
.                       3600000      NS    G.ROOT-SERVERS.NET.
G.ROOT-SERVERS.NET.     3600000      A     192.112.36.4
.                       3600000      NS    H.ROOT-SERVERS.NET.
H.ROOT-SERVERS.NET.     3600000      A     128.63.2.53
.                       3600000      NS    I.ROOT-SERVERS.NET.
I.ROOT-SERVERS.NET.     3600000      A     192.36.148.17
```

Figure II-56. Cache File Example for Internal Name Server

Figure II-57 shows **db.127.0.0**.

```
;/etc/security/firewall/DNS/INTERNAL/public/db.127.0.0
;
0.0.127.in-addr.arpa. IN SOA typhoon.storm.com. sysadm.storm.com. (
        1995101601   ; serial number
        10800        ; refresh
        3600         ; retry
        86400        ; expire
        86400        ; time to live
)
;
0.0.127.in-addr.arpa.   IN NS   typhoon.storm.com.
;
1.0.0.127.in-addr.arpa. IN PTR  localhost.
```

Figure II-57. Database File Example for 0.0.127.in-addr.arpa. Domain

Network Configuration Database File (netconfig)

Use the **/etc/netconfig** file to specify when DNS is used for name-to-address lookups by including **/usr/lib/resolv.so** as a lookup library in field 7 for all **inet** family lines. The following example shows the placement of **/usr/lib/resolv.so** in the **/etc/netconfig** file. For further information about the network configuration database, refer to the **netconfig(4)** system manual page.

```
# /etc/netconfig
tcp   tpi_cots_ord v inet tcp  /dev/tcp /usr/lib/tcpip.so,/usr/lib/resolv.so
udp   tpi_clts     v inet udp  /dev/udp /usr/lib/tcpip.so,/usr/lib/resolv.so
icmp  tpi_raw      - inet icmp /dev/icmp /usr/lib/tcpip.so,/usr/lib/resolv.so
rawip tpi_raw      - inet -    /dev/rawip /usr/lib/tcpip.so,/usr/lib/resolv.so
```

Figure II-58. DNS in the Network Configuration Database File

DNS Resolver Configuration File (resolv.conf)

A *resolver* is a routine, called by an application, that performs name and address translation. Resolvers eliminate the overhead of constructing a DNS packet to query a name server. Another reason resolvers are used is because name address translation is not always done through the DNS; resolution can be done by DNS, Network Information Services (NIS), or the **/etc/inet/hosts** file.

Configure resolvers so that all internal hosts query the correct name server by creating or modifying the **/etc/resolv.conf** file. This file is read by the resolver routines the first time they are invoked by a process.

Format guidelines:

- Each statement is on a separate line
- Keywords and values are separated with white space (spaces or tabs)

Format:

keyword value

Statements:

domain *name*
Default domain to append to names that do not have a dot in them.

nameserver *IP_address*
IP address of the name server that the resolver should query.

The following example shows the **/etc/resolv.conf** file for the firewall.

```
domain storm.com.
nameserver 192.168.25.170
```

Figure II-59. Resolver Configuration File Example

For internal hosts, how you configure resolvers depends on what operating system you are running. *DNS and BIND* by Albitz and Liu provides a list for different systems.

Note: You cannot use subnetted IP addresses on the internal side of the firewall if you want to resolve names on the firewall. The **/etc/resolv.conf** file does not allow a classless IP address as the address of the name server.

Classless IP Addresses Database File (zonemap)

The **/etc/security/firewall/DNS/zonemap** file is used to store important zone and address information if classless addresses are used for split DNS. This file lists all user-supplied zone name information as well as information needed to reconstruct the original network address and mask. For further information about classless addresses, see "Classless IP Addresses for Split DNS" on page II-121.

Domain Name Server Command (named)

You can use the domain name server daemon **named** to enable a name server without rebooting the system.

Syntax:

/usr/sbin/firewall/named [**-d** *level*] [**-p** *port*] [**-b** *bootfile*]

Options and arguments:

-d *level* — Print debugging information. *level* is a number from 1 to 9 that indicates the level of messages printed. Higher numbers give more detailed debugging information.

-p *port* — Use a different port number than the default from **/etc/inet/services**.

-b *bootfile* — Specify a boot file other than the default, **/etc/inet/named.boot**. *bootfile* can be a full path name or relative path name. If multiple boot files are specified, only the last is used. Any additional arguments are taken as the name of a boot file.

Name Server Testing with nslookup

Use the **nslookup** tool to verify that you have set up your name servers correctly.

When used with other commands, **nslookup** can verify the basic setup of a name server:

- The external **named** can resolve outside names
- The external **named** contains minimal information about its domain
- The internal **named** can resolve outside names
- The internal **named** can resolve names inside the domain
- The **/etc/resolv.conf** file is correct on the firewall
- Zone transfers occur
- Recursive queries occur

To test your name servers:

1. Disable packet filtering.
2. Verify that both name servers are running.
3. Test basic setup and security features with **nslookup**.
4. Re-enable packet filtering.

Note: All tests with **nslookup** should be done from an inside host.

How to Set Up the Split DNS Testing Environment

Note: Automatically generated rules for DNS should permit testing. Otherwise, use the following procedure on the firewall to open *all* domain traffic.

You must enable DNS packets through the firewall and make sure the name servers are running.

To enable DNS packets through the firewall:

1. Edit the **/etc/security/firewall/ng_inet/netguard.conf** file:
   a. (Optional) Comment out all rules pertaining to **domain**.

   b. Add the following rules before the old **domain** rules. These rules allow all DNS packets to pass through the firewall.

```
permit domain/udp EVERYONE EVERYONE ENABLE_REPLY
permit domain/tcp EVERYONE EVERYONE
```

2. Run the **/usr/sbin/firewall/netguard** command to update the firewall with the new rules.

Note: Remember that running **netguard** changes the packet-filtering rules for subsequent connections made through the firewall. You may want to test your name servers when network activity is minimal.

To verify that both name servers are running:

1. Use the **ps** command to show all active processes and the **grep** command to filter lines with "named" in them. The following example shows this command and its output.

```
ps -ef | grep named
root 809 1 1 0 11:06:39 ? 0:00 /usr/sbin/firewall/named -b
     /etc/security/firewall/DNS/EXTERNAL/public/bootfile
root 812 801 1 2 11:07:12 L0.1/ttyA1 0:00 grep named
root 811 1 1 0 11:07:08 ? 0:00 /usr/sbin/firewall/named -b
     /etc/security/firewall/DNS/INTERNAL/private/bootfile
```

2. Start the name servers if they are not running. The external name server should be started first, as shown in the following example.

```
named -b /etc/security/firewall/DNS/EXTERNAL/public/bootfile
named -b /etc/security/firewall/DNS/INTERNAL/private/bootfile
```

How to Test Name Servers

The **nslookup** utility is normally run non-interactively but also can be run interactively.

To run nslookup non-interactively:

The most common way to use **nslookup** is to type the **nslookup** command followed by a host name. This command returns the host's IP address. If the **/etc/resolv.conf** file on the host is correct, the server's address should be the address of the internal interface. Use the **nslookup** command followed by **localhost** as shown in the following example:

```
/usr/sbin/nslookup localhost
Server:  typhoon.storm.com
Address:  192.168.25.170

Name:  localhost.storm.com
Address:  127.0.0.1
```

In this example, the IP address of `localhost` is `127.0.0.1`.

To run nslookup interactively:

1. Run **nslookup** without arguments to get into interactive mode.

```
/usr/sbin/nslookup
Default Server: typhoon.storm.com.
Address: 192.168.25.170
```

   From the prompt, there are several commands you can issue. To get a complete listing you can type **?**. To exit **nslookup**, press Ctrl+d on your keyboard.

2. Type **server** followed by the external interface's address to have **nslookup** talk to the external **named**.

```
server 192.168.45.170
Default Server:  [typhoon.storm.com.]
Address:  192.168.45.170
```

3. Type **ls** followed by your domain. The **ls** command in **nslookup** issues a query of type=T_AXFR (zone transfer).

   - If zone transfers (privileged addresses) are configured, you will see the following:

```
ls storm.com.
[[typhoon.storm.com.]]
Host or domain name        Internet address
 storm                     server = typhoon.storm.com
 localhost                 127.0.0.1
 typhoon                     192.168.45.170
```

   - If zone transfers (privileged addresses) are not configured, you will see the following:

```
ls storm.com.
[[typhoon.storm.com.]]
Host or domain name            Internet address
*** Error during listing of storm.com.: Query refused
```

4. Enter a host name that is outside your domain.

   - If recursive queries (forwarders) are configured, you will see the following:

```
ftp.uu.net.
Server:  [typhoon.storm.com.]
Address:  192.168.45.170

Name:    ftp.uu.net
Address:  192.48.96.9
```

   - If recursive queries (forwarders) are not configured, you will see the following:

```
ftp.uu.net.
Server:  [typhoon.storm.com.]
Address:  192.168.45.170
*** [192.168.45.170] can't find ftp.uu.net.: Query
refused
```

5. Type the firewall name. Recursive queries apply only to names outside the domains for which the name server is authoritative, so the name server will resolve the firewall name.

```
typhoon.storm.com.
Server:  [typhoon.storm.com.]
Address:  192.168.45.170
```

```
Non-authoritative answer:
Name:    typhoon.storm.com
Address:  192.168.45.170
```

6. Type the name of an internal host. Because you are talking to the external **named**, it will have no information about the host.

```
hurricane.storm.com.
Server:  [typhoon.storm.com.]
Address:  192.168.45.170

*** No address information available for hurricane.storm.com.
```

7. Type **server**, followed by the internal interface's address:

```
server 192.168.25.170
Default Server:  [typhoon.storm.com.]
Address:  192.168.25.170
```

8. Type the name of an internal host. Since you are talking to the internal name server it should have address information for an internal host.

```
hurricane.storm.com.
Server:  [typhoon.storm.com.]
Address:  192.168.25.170

Name:    hurricane.storm.com
Address:  192.168.25.172
```

9. Type a host name that is outside your domain. This verifies that the internal **named** can resolve outside names. The non-authoritative line will be present if a previous search cached the resource record for `ftp.uu.net`.

```
ftp.uu.net.
Server:  [typhoon.storm.com.]
Address:  192.168.45.170

Non-authoritative answer:
Name:    ftp.uu.net
Address:  192.48.96.9
```

After testing is complete, reinstate the correct packet-filtering rules:

1. Edit the **/etc/security/firewall/ng_inet/netguard.conf** file:

   a. Remove the rules you added before testing:

   ```
   permit domain/udp EVERYONE EVERYONE ENABLE_REPLY
   permit domain/tcp EVERYONE EVERYONE
   ```

   b. (Optional) Un-comment the **domain** rules that you commented out.

2. Run the **/usr/sbin/firewall/netguard** command to update the firewall with the new rules.

DNS Maintenance

Common maintenance issues you might encounter as your domain grows include:

- Adding a host to an existing network
- Removing a host
- Adding a host to a new network
- Delegating a sub-domain

The examples in this section imply the use of an internal interface (private side). All file examples are located in the **/etc/security/firewall/DNS/INTERNAL/private/** directory.

How to Add a Host to an Existing Network

The steps in this section explain how to add a host to an existing network. As an example, a new host, `tropical`, with IP address `192.168.25.177`, has been added to the `storm.com.` domain. Since `tropical.storm.com.` is in the `storm.com.` domain and the `25.168.192.in-addr.arpa.` domain, the files `db.storm` and `db.192.168.25` need to be edited. This information will be known only inside the firewall, so the external name server's files will be unchanged.

To add a host to an existing network:

1. Add the new address record to the domain database file, `db.storm` (Figure II-54):

   ```
   tropical.storm.com. IN A 192.168.25.177
   ```

2. Add the corresponding pointer record to the database file, `db.192.168.25` (Figure II-55):

   ```
   177.25.168.192.in-addr.arpa. IN PTR tropical.storm.com.
   ```

3. Increase the `SOA` records. You can either increment them or adjust the numbers in the *YYYYMMDDNN* format. The advantage of this format is that you can tell the last time you modified the database file. The NN field (version) can be left in or dropped.

4. Reload the name server's database by sending a hangup signal to **named** as shown in the following example:

   ```
   kill -HUP 'cat /etc/named.pid.192.168.25.170'
   ```

   The **kill** command is used to send signals to processes. The `/etc/named.pid.192.168.25.170` file contains the process ID (PID) of the internal name server.

How to Remove a Host from an Existing Network

In this example, the host `thunder` has been removed from the `storm.com.` domain. The resource records for `thunder.storm.com.` must be removed from the files `db.storm` and `db.192.168.25`.

1. Remove the address record from the domain database file, `db.storm` (Figure II-54):

```
thunder.storm.com. IN A 192.168.25.174
```

2. Remove the corresponding pointer record, `db.192.168.25` (Figure II-55):

```
174.25.168.192.in-addr.arpa. IN PTR thunder.storm.com.
```

3. Increase the `SOA` records. You can either increment them or adjust the numbers in the *YYYYMMDDNN* format.

4. Send a `HUP` signal to **named** to update its information.

How to Add a Host with a New Network Number

The steps in this section explain how to add a host with a different network number. As an example, the host `winter` has been added. This host will bridge the `192.168.25` network and the `192.168.15` network. Its IP addresses are `192.168.25.180` and `192.168.15.100`.

1. Add the new domain to the boot file, `bootfile` (Figure II-49):

```
primary 15.168.192.in-addr.arpa db.192.168.15
```

2. Create a new database file to contain resource records for the domain, `db.192.168.15`, for the `15.168.192.in-addr.arpa.` domain:

```
15.168.192.in-addr.arpa. IN SOA typhoon.storm.com. sysadm.storm.com.
(
   1995101601 ; serial number
   10800      ; refresh
   3600       ; retry
   86400      ; expire
   86400      ; time to live
)
15.168.192.in-addr.arpa.        IN NS   typhoon.storm.com.
100.15.168.192.in-addr.arpa.    IN PTR  winter.storm.com.
```

3. Add the new address records to the domain database file, `db.storm` (Figure II-54):

```
winter.storm.com. IN A 192.168.25.180
winter.storm.com. IN A 192.168.15.100
```

4. Add the corresponding pointer record, `db.192.168.25` (Figure II-55):

```
180.25.168.192.in-addr.arpa. IN PTR winter.storm.com.
```

5. Increase the `SOA` records. You can either increment them or adjust the numbers in the *YYYYMMDDNN* format.

6. Reload the name server's database by sending a `HUP` signal to **named**.

How to Delegate a Sub-Domain

When you delegate a sub-domain, the domain name server needs to know the sub-domain name server (by name and address) to which the sub-domain is delegated. You must add records to the database files to define this information. The example in this section adds several hosts to the new sub-domain of the new network. The new sub-domain is `winter.storm.com.`; the name server for the sub-domain is `ice` (`192.168.15.100`); other hosts in the sub-domain include `hail` (`192.168.15.101`), `sleet` (`192.168.15.102`), and `snow` (`192.168.15.103`).

1. Add the new sub-domain to the boot file, `bootfile` (Figure II-49):

```
primary     168.192.in-addr.arpa     db.192.168
```

2. Add the new address records and new sub-domain record to the domain database file, `db.storm` (Figure II-54):

```
winter.storm.com.      IN  NS   ice.winter.storm.com
ice.winter.storm.com.  IN  A    192.168.15.100
```

3. Create a new database file to contain resource records for the new domain:

```
; /etc/security/firewall/DNS/INTERNAL/private/db.192.168
168.192.in-addr.arpa. IN SOA typhoon.storm.com. sysadm.storm.com. (
   1995101601  ; serial number
   10800       ; refresh
   3600        ; retry
   86400       ; expire
   86400       ; time to live
)
15.168.192.in-addr.arpa  IN   NS    ice.winter.storm.com.
```

4. Make sure a properly configured name server is running on the host to which you are delegating authority (`ice`, in the example). You must configure the following files to do this:

   a. Add the name server definition to a boot file (ex. `named.boot`):

```
primary  winter.storm.com         db.winter.storm.com
primary  15.168.192.in-addr.arpa  db.192.168.15
```

b. Create a database file for the address records:

```
; db.winter.storm.com
ice.winter.storm.com   IN A 192.168.15.100
hail.winter.storm.com  IN A 192.168.15.101
sleet.winter.storm.com IN A 192.168.15.102
snow.winter.storm.com  IN A 192.168.15.103
```

c. Create a database file for the pointer records:

```
; db.192.168.15
100.15.168.192.in-addr.arpa. IN PTR ice.winter.storm.com.
101.15.168.192.in-addr.arpa. IN PTR hail.winter.storm.com.
102.15.168.192.in-addr.arpa. IN PTR sleet.winter.storm.com.
103.15.168.192.in-addr.arpa. IN PTR snow.winter.storm.com.
```

5. Increase the SOA records. You can either increment them or adjust the numbers in the *YYYYMMDDNN* format.

6. Reload the name server's database by sending a **HUP** signal to **named**.

7. To allow the internal **named** to forward requests for the sub-domain to this name server, you must edit the internal boot file and add the nocache keyword. This maintains the security offered by the internal **named** not forwarding requests outside the firewall.

Troubleshooting DNS

You can examine files and use commands to detect and correct problems you may have with DNS.

- In the Shell window, look for clues in the following configuration files:
  - **/etc/security/firewall/DNS/INTERNAL/*/bootfile**
  - **/etc/security/firewall/DNS/EXTERNAL/*/bootfile**
  - **/etc/security/firewall/DNS/INTERNAL/*/db.*domain*.com**
  - **/etc/security/firewall/DNS/EXTERNAL/*/db.*domain*.com**
  - **/etc/security/firewall/DNS/INTERNAL/*/***
  - **/etc/security/firewall/DNS/EXTERNAL/*/***
  - **/etc/rc2.d/S72firewall**
  - **/etc/security/firewall/startup.conf**
  - **/etc/netconfig**
  - **/etc/resolv.conf**
  - **/etc/security/firewall/ng_inet/netguard.conf**
- In the Shell Window, run the following commands:
  - Look for deny rules for DNS.

```
/usr/sbin/firewall/netguard -An | grep names
```

- Ensure that DNS can lookup a host.

  /usr/sbin/nslookup *host*

- **ping** a host.

  /usr/sbin/ping -s *host*

- Determine if you have a route to a host.

  /usr/bin/netstat -rn

- Determine if **named** is running.

  ps -ef | grep named

- Look for fatal errors from **named**.

  tail /var/adm/syslog

- Enable tracing and logging.

  kill -USR1 *PID*

  Repeat up to ten times for ten levels of debugging. Three times is usually enough. (**Note:** On a busy system, this can take a lot of disk space.)

- Write the name server's internal database to **/var/tmp/named.db**.

  kill -INT *PID*

- Turn off debug mode.

  kill -USR2 *PID*

- Look for spelling errors and misplaced periods in the DNS configuration files if these files were hand edited.

- In the Packet-Filtering Rules window, look for missing packet-filtering rules. These may be due to unchecking the **Update Packet-Filter Rules** field on the DNS Setup page of the Split Domain Name System (DNS) window.
- In the Static Routes page of the Routing window, look for a blank **Address for Default Route** field.

Note: If DNS stops working after a reboot (or a **Use** on the Network Interfaces window), you may have redefined one or more of your interfaces and confused DNS.

See also:

- "Network Ping Test Window" on page I-279
- "Shell Window" on page I-310
- "Packet-Filtering Command (netguard)" on page II-50
- "Static Routes Page" on page II-83
- "Split Domain Name System Window" on page II-114

Chapter 8
Users

Accurate and strong user identification and authentication (I&A) is a critical aspect of firewall security. To access the CyberGuard Firewall, a user must have a login ID and a method of authentication. The CyberGuard Firewall supports the following methods of identification and authentication:

- UNIX passwords (for UnixWare firewalls)
- NT passwords (for Windows NT® firewalls in target groups)
- RADIUS™
- Central Authentication
- Remote Authentication
- SecurID®
- SecureNet® Key

Users can be configured to use one authentication method for inbound connections and another for outbound connections.

For the highest level of security, accounts on the firewall should be limited to administrative users such as Firewall Security Officers. To achieve this, the CyberGuard Firewall supports the following types of users:

- Proxy
- Firewall Security Officer (FSO)
- Firewall Security Monitor (FSM)
- Unprivileged
- Remote Group
- Administrative

(For a complete description of user types, see “Default User Information Window” on page II-168.) FSO, FSM, Unprivileged, and Administrative users have firewall accounts and are authorized to login to the firewall. These users require security levels. A Proxy user does not have an account on the firewall and is authorized to use only the authenticating proxy services of the firewall. Security levels are not required for Proxy users.

One special Proxy user is the DEFAULT user. A DEFAULT user record is used to select a remote authentication server for the identification and authentication of users who are not in the CyberGuard Firewall’s user database. Only the remote authentication server methods (RADIUS, SecurID, and SecureNet Key) are valid authentication choices; initially, both internal and external authentication methods are disabled. The DEFAULT user entry allows the configuration of default FTP operations and default Passport One rules.

Note: All users are eligible to use configured proxy services. Proxy users can use only proxy services.

RADIUS

Note: RADIUS requires the customer to install a third-party authentication service separate from the firewall.

The Remote Authentication Dial-In User Service (RADIUS) by Lucent Technologies InterNetworking Systems (formerly Livingston Enterprises, Inc.), is an IP-based protocol for a Network Access Server (NAS) to communicate with a database server of authorized users. The RADIUS system consists of two parts: an authentication server and client protocols.

RADIUS authenticates users through a series of communications between the client and the server. After a user is authenticated, the client provides the user with the appropriate network services. In its generic form, RADIUS will authenticate users against a UNIX password file, the Network Information Service (NIS), and a separately maintained RADIUS database. The RADIUS server also can be adapted to work with third-party security products or proprietary security systems.

RADIUS is also used for Central Authentication and Remote Authentication. For more information, see “SecurID” on page II-152 and “Remote Authentication” on page II-151

For complete information about RADIUS, refer to Lucent Technologies InterNetworking Systems’ documentation.

See also:

- “RADIUS Page” on page II-163
- “How to Configure RADIUS” on page II-173

Central Authentication

Central Authentication allows the firewall to be administered by users who are managed on a central RADIUS- or LDAP-compliant authentication server. Central Authentication does not require the manual configuration of the Administrative user on the firewall. After successful authentication at a properly configured RADIUS or LDAP server, centrally authenticated administrators are automatically added to the firewall user configuration based on properties configured on the authentication server (see “How to Configure Central Authentication” on page II-174). This is a tremendous benefit when managing large numbers of firewalls: the administrator does not need to be preconfigured on every firewall.

Central Authentication is designed to work in conjunction with Remote Web Administration. The Remote Web Administration server running on the firewall uses **telnet** to authenticate with the firewall and then execute the CyberGuard GUI application. Authentication is performed by the **telnet** daemon (**in.telnetd**) running on the firewall. Because the Remote Web Administration server is also running on the firewall, no packet filter rules are required for the **telnet** connection.

The Remote Web Administration server is typically configured to connect to the firewall's fully qualified domain name (FQDN). If the FQDN is associated with an external interface address on the firewall, Central Authentication attempts to match authentication rules defined for external (inbound) interfaces. If the FQDN is associated with an internal interface address on the firewall, Central Authentication attempts to match authentication rules defined for internal (outbound) interfaces.

Configuring Central Authentication creates a RADIUS or LDAP authentication configuration, adds the CentralAuth method to the authentication module database, adds an application-service authentication rule for the firewall telnet server, creates packet-filtering rules to access the RADIUS or LDAP servers, and inserts CentralAuth as a GUI authentication method. If Central Authentication fails for any reason, the firewall configuration is restored to its previous state.

Note: Central Authentication is intended for Administrative users, not for Proxy users.

See also:

- "Central Authentication Page" on page II-164
- "How to Configure Central Authentication" on page II-174
- "Remote Web Administration" on page I-163

Remote Authentication

The Remote Authentication method provides support for retrieving remote-client policy attributes defined on a RADIUS or LDAP authentication service (after successful authentication with that service). Currently supported remote-client attributes are Passport One group names and VPN client configuration.

Passport One Group Names

Passport One group names authorize use of Passport One access profiles. Users are defined on the remote RADIUS or LDAP service with attributes that map into a group name defined on the firewall. The group name is returned by the authentication service after successful authentication of the user. The group name then translates into a Passport One profile.

Note: To use the RADIUS or LDAP attributes that define remote group membership, the remote group name is configured on the firewall. To add a Passport One remote group name to the firewall configuration, add the name as a Remote Group type on the User Information Page of the Users Window, and then configure the Passport One profile.

For more information on configuring Remote Authentication using a RADIUS server, see "How to Configure Remote Authentication" on page II-177.

VPN Client Configuration

When a VPN client is tunneling to a CyberGuard Firewall VPN gateway, it is often desirable to make the host appear to be present on an internal network. To provide this capability, the VPN client configuration (the Virtual IP address, WINS server, and DNS server) is passed to the client by the VPN Policy Manager (vpnguard). When the firewall is configured to use the ISAKMP Configuration Method (See VPN Client Configuration), the VPN address configuration may be obtained from RADIUS or LDAP authentication services.

The VPN address attributes are returned by the authentication service after successful authentication of the user via IKE Extended Authentication (XAUTH).

For more information on configuring Remote Authentication using an LDAP server, see “LDAP Authentication Window” on page I-297.

See also:

- “Remote Authentication Page” on page II-164
- “Passport One” on page II-185
- “Passport One Profiles Page” on page II-192

SecurID

Note: SecurID requires the customer to install a third-party authentication service separate from the firewall.

SecurID by RSA Security, Inc., is a token authentication method that requires a user to supply a unique, single-use password for each access. A valid password is a combination of a PIN and a code generated by an electronic password generator. All attempts to gain access into a SecurID protected system are logged to a file, and user access can be restricted or denied.

SecurID authentication at the firewall is accomplished within the supported system utilities such as **login(1)** by establishing a dialog with a system running the ACE/Server® server software. The firewall is a client of the ACE/Server. Activity logging is done both at the firewall and the SecurID authentication server system.

For complete information about SecurID, refer to RSA Security’s documentation.

See also:

- “SecurID Page” on page II-163
- “How to Configure SecurID” on page II-180

SecureNet Key

Note: SecureNetKey requires the customer to install a third-party authentication service separate from the firewall.

SecureNet Key by AXENT™ Technologies, Inc. is a challenge-response, personal identification token that consists of the following components:

- **SecureNet Key (SNK)**. This challenge-response, personal identification token resembles a pocket-sized calculator.
- **Defender Security Server (DSS)**. This software device contains a database of valid users and an AXENT agent interface. The agent interface performs the Challenge/Response Security Dialog with users requesting access to

protected access devices. It works with the agent interface in the DSS to authenticate valid remote access to protected networks.

- **Protected Access Device**. The CyberGuard Firewall acts as an AXENT agent and works with the agent interface in the DSS to authenticate valid remote access users.
- **Defender Management Software (WinDMS)**. This AXENT software manages Defender devices, user information, auditing, and reporting. It also can be used to access the DSS Console application for configuring Defender Security Servers, their agents, and security dialog prompts.

SecureNet Key authentication at the firewall is accomplished within the supported system utilities (such as **login(1)**) by establishing a dialog with a system running DSS Defender Security Monitor and WinDMS. The firewall is an agent of the DSS. Activity logging is done both at the firewall and the DSS system.

For complete information about SecureNet Key, refer to AXENT's documentation.

See also:

- "SecureNetKey Page" on page II-164
- "How to Configure SecureNet Key" on page II-181

Users Window

Use this window to view, add, change, or delete users. The expanded Users window has five notebook pages: the User Information page, the Authentication page, the FTP Operations page, and the Passport One Rules page.

Note: You can create templates to assign default login IDs for FSO, FSM, and Unprivileged users and permitted FTP operations to new users through the Default User Information and Default FTP Operations windows, respectively. These windows provide a quick method of entering information for more than one user.

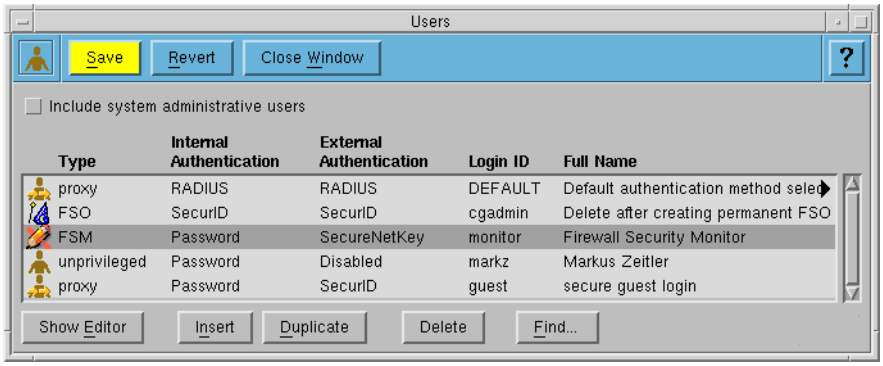


Figure II-60. Users Window

This window displays the following information:

Include system administrative users
Displays Administrative users for viewing and editing.

Type Displays the user type, which can be one of the following types (for descriptions, see "Users - User Information Page" on page II-155, **User Type**):

Proxy
Firewall Security Officer
Firewall Security Monitor
Unprivileged
Remote Group
Administrative

Internal Authentication
External Authentication

Current authentication method for internal and external interfaces. Users can be assigned one of the following authentication methods for each interface (for descriptions, see "Users - Authentication Page" on page II-158):

Password
NT Password
RADIUS
SecurID
SecureNet Key
Disabled

Login ID Name used to uniquely identify the user and the user's data.

Full Name Name or function of the user.

See also:

- **tfadmin(1M)** system manual page
- "Window Components" on page I-10
- "Shell Window" on page I-310
- "RADIUS" on page II-150
- "SecurID" on page II-152
- "SecureNet Key" on page II-152
- "Users - User Information Page" on page II-155
- "Users - Authentication Page" on page II-158
- "How to Add or Change a User" on page II-170
- "How to Delete a User" on page II-171
- "How to Set Defaults for New Users" on page II-172
- "File Transfer Protocol Proxy" on page III-21

Users - User Information Page

Use this page of the expanded Users window to add or change user and security information.

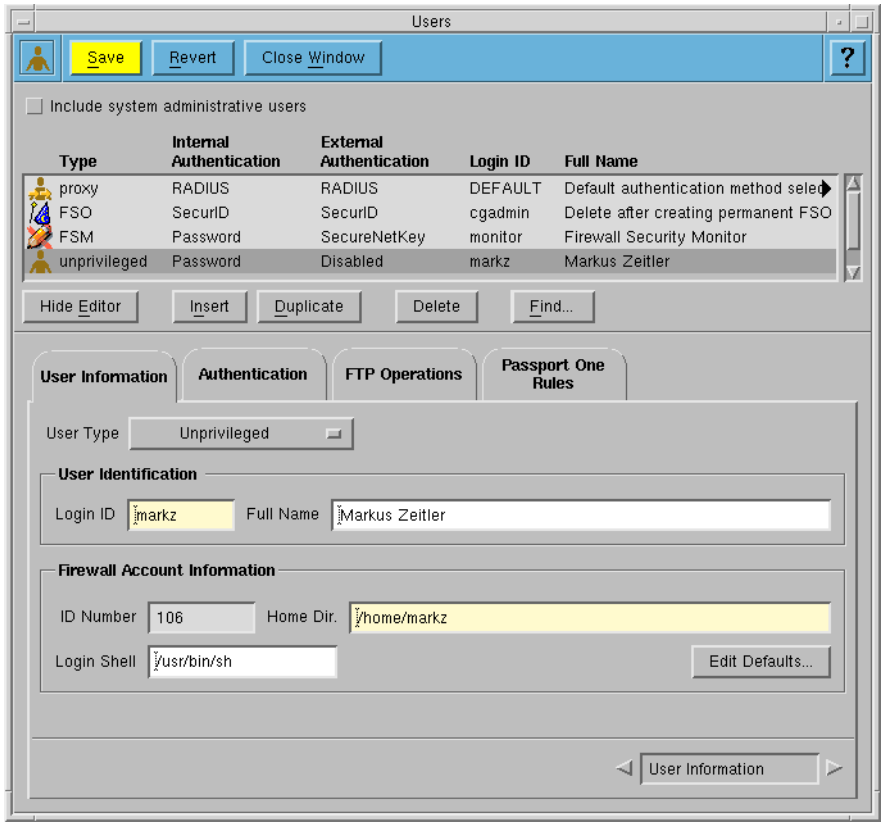


Figure II-61. Users Window (Expanded) - User Information Page

This page contains the following fields and push buttons:

User Type Has the following settings:

Proxy
Authorized to use only the proxy services of the firewall and cannot have an account on the firewall. **Proxy** is the default user type. The DEFAULT user is a proxy user.

Firewall Security Officer
Privileged Firewall Security Officer. Encompasses all commands associated with administrative roles (auditor, site security officer, network administrator, security operator, and operator) and firewall-related commands installed on the system. This user type is cleared to the **SYS_PRIVATE** and **NETWORK** levels and has an ID number greater than or equal to 100.

Firewall Security Monitor
Read-only, privileged user who can monitor but not change the CyberGuard Firewall. This user type is cleared to the **NETWORK** level and has an ID number greater than or equal to 100.

Unprivileged
Authorized to login to the firewall, but has no administrative privileges. For best security, limit accounts on the firewall to the FSO and FSM. This user type is cleared to the **NETWORK** level and has an ID number greater than or equal to 100.

Remote Group
Used to select the Passport One profile after successful Remote Authentication (RemoteAuth). The Remote Group name will match authorization information returned by a RADIUS or LDAP authentication server. When the Remote Group user type is chosen, only the User Information and Passport One Rules pages can be edited.

Administrative
Special system user type, most likely a daemon. Except for the password, do not change, delete, or add. This user type has an ID number greater than 0 and less than 100.

Login ID — Name used to uniquely identify the user.

Full Name — User's full name or job function.

The following fields are active for all users except Proxy users:

ID Number — Unique integer used to associate files with a user's login ID. This value is generated automatically if **Use system-generated ID numbers** is checked in the Default User Information window.

Home Dir. — Directory that receives user data after logging in. Once edited, this field no longer shows changes to the login ID. You can set the parent directory of this directory in the Default User Information window.

Login Shell — Name of the user's login shell.

Edit Defaults — Sets up a template for new firewall users by opening the Default User Information window. This button is not selectable for Proxy users.

General Notes:

- All users are eligible to use configured proxy services. Proxy users can use only proxy services.
- Administrative users cannot change to any other type of user, and non-administrative users cannot become Administrative users.
- The DEFAULT user is a Proxy user and cannot change to any other user type.

- Delete non-Proxy users only when their files are no longer on backup media. Instead, set the users' internal and external authentication methods to **Disabled** to prevent them from logging in. When you delete a user, you also delete the user's home directory and its contents and mail files.
- Changing a user from an FSO, FSM, or Unprivileged user to a Proxy user has the same effect as deleting the user - all files and the home directory are deleted.
- For security purposes, the Multilevel Secure (MLS) protection on the firewall prevents a user from using Telnet or Rlogin to login to the firewall and become superuser.
- During the installation of Release 4.x, when UnixWare user records are imported into the firewall user database, all users are designated as Unprivileged users. The firewall administrator must change each user who should be a Proxy user. Refer to the **cg_dbadm(1M)** online manual page for complete information.

FSO Notes:

- In the Shell window, FSO users should prefix each administrative command (and many common commands) with the **/sbin/tfadmin** command. This will provide access to the full functionality of these commands. For example:

  ```
  /sbin/tfadmin newlvl SYS_PRIVATE
  ```

- To become the root user, execute the **tfadmin** command and **su** to **root**:

  ```
  /sbin/tfadmin newlvl SYS_PRIVATE
  su root
  ```

- The FSO's home directory is cleared to **SYS_PUBLIC**; as such, it is not writable. Two subdirectories are created in the FSO's home directory: **sys_private** and **network**. Each is cleared to the implied level and is writable when the FSO logs in at that level.
- An FSO cannot delete his own ID.

For syntax, values, and defaults, see the Glossary. For information about the firewall user database, see "Users - Underlying Constructs" on page II-183.

Users - Authentication Page

Use this page of the expanded Users window to define how the selected user will be authenticated.

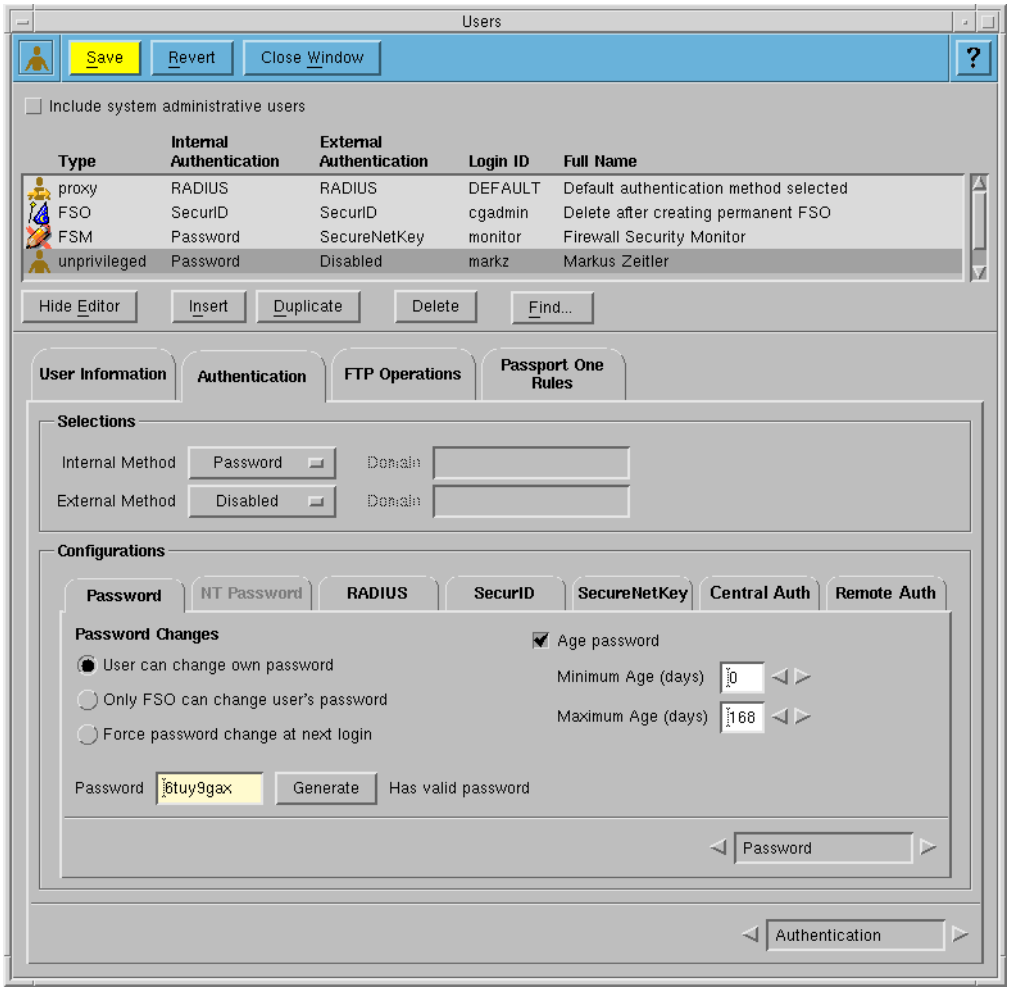


Figure II-62. Users Window (Expanded) - Password Authentication Page

This page contains the following fields:

Internal Authentication Method
External Authentication Method

Both fields have the following choices:

Password - UnixWare password.

NT Password - Windows NT password. This choice is not active when configuring a regular firewall or the CyberGuard Manager; this choice is active only when configuring a Target Group. Choosing **NT Password** activates the **Domain** field.

RADIUS - This third-party is a remote access authentication server that must be installed and configured for this choice to be active.

SecurID - This third-party product is a token authentication method that must be installed and configured for this choice to be active.

SecureNet Key - This third-party product is a token authentication method that must be installed and configured for this choice to be active.

Disabled - User cannot login.

Domain — (Optional) Windows NT domain that will perform authentication. A domain can consist of 15 alphanumeric characters and cannot contain spaces. If no domain is specified, the firewall to which this information is propagated will handle authentication using one of the other methods, such as **NT Password**, provided by the firewall. If a domain is specified, be sure to enter a valid domain into this field as the CyberGuard Manager cannot check that the domain exists.

Notes:

- When users are disabled, their IDs are not reused. Therefore, no one can accidentally become the owner of someone else's files. Delete users only when you are confident that their files are no longer needed.
- Because the Central Manager does not know what software is installed on a target firewall or what type of firewall (UnixWare or Windows NT) comprises a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.
- CyberGuard Corporation discourages using **Password** as the **External Authentication** method for external connections. The more secure methods, RADIUS, SecurID and SecureNet Key are preferred. You can select **Password** as the **Internal Authentication** method if the user will be accessing the firewall from the internal network.
- RADIUS, SecurID, and SecureNet Key may require an extended interactive login dialog. Some applications cannot provide this interactive login. Applications such as FTP, HTTP, Rlogin, and Telnet can provide an interactive login.
- Regardless of the chosen authentication method, the FSO cannot login as **root**. The only way to become **root** is to change levels with the **tfadmin** and **newlvl** commands and then use the **su** command, as follows:

```
/sbin/tfadmin newlvl SYS_PRIVATE
su root
```

See also:

- "How to Configure RADIUS" on page II-173
- "How to Configure SecurID" on page II-180
- "How to Configure SecureNet Key" on page II-181
- "Central Management Role Window" on page I-115

Password Page

Use this page of the Authentication Page to configure the password authentication method.

CAUTION!

For security purposes, passwords *cannot be retrieved*. Memorize passwords and destroy all hard copies of passwords.

Password Changes Establishes conditions for changing the password. Has the following settings:

User can change own password
(Default for new users)

Only FSO can change user's password

Force password change at next login
Not recommended for users who will login to the firewall.

Age password Limits the life of a password. This check box is enabled only if **User can change own password** or **Force password change at next login** is selected.

Minimum Age (days)
Shortest time (0-441 days) that this password can remain unchanged. This setting is enabled only if **Age password** is checked. It prevents users from immediately changing their passwords back to what they were before. The default is 0.

Maximum Age (days)
Longest time (1-441 days) that this password can remain unchanged. Once this time has expired, the user must change the password at the next login. This setting is enabled only if **Age password** is checked. The default is 1.

Password Allows a newly hand-entered password or displays a generated password. A suitable value in this field changes the password status displayed to the right of the **Generate** button to **Has valid password**.

Generate Assigns the user a valid password and displays the password in the **Password** field. Do not click on this button if you have entered your own password in the **Password** field.

Notes:

- Proxy users must use the **-p** option at the login prompt to change their passwords:

  `login: -p` *username*

- An FSO can change a user's password to anything he chooses. However, when a user changes his own password through the command line, or when the password expires and the user is prompted to change it through the login manager, the password must have the following attributes:

  - Passwords must contain the minimum number of characters as defined in the **Enter minimum password length** on the "Security Options - Password Options Page" on page II-230. Only the first eight characters are significant.

  - If the **Require passwords to be a combination of mixed case, numbers, and punctuation** field on the "Security Options - Password Options Page" on page II-230 is checked, passwords must contain a combination of three (3) of four (4) of the following:

    - An uppercase letter
    - A lowercase letter
    - A number
    - Some form of punctuation

  - Passwords must differ from the user's login name and any reverse or circular shift of that login name. (Corresponding uppercase and lowercase letters are considered equivalent.)

  - A new password must differ from the old one by at least three positions.

  - The password cannot have been used within the length of time specified by the **Enter length of password history** field on the "Security Options - Password Options Page" on page II-230.

- Because the Central Manager does not know what software is installed on a target firewall or what types of firewalls (UnixWare or Windows NT) comprise a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

NT Password Page

Use this page of the Authentication Page to configure the NT Password authentication method.

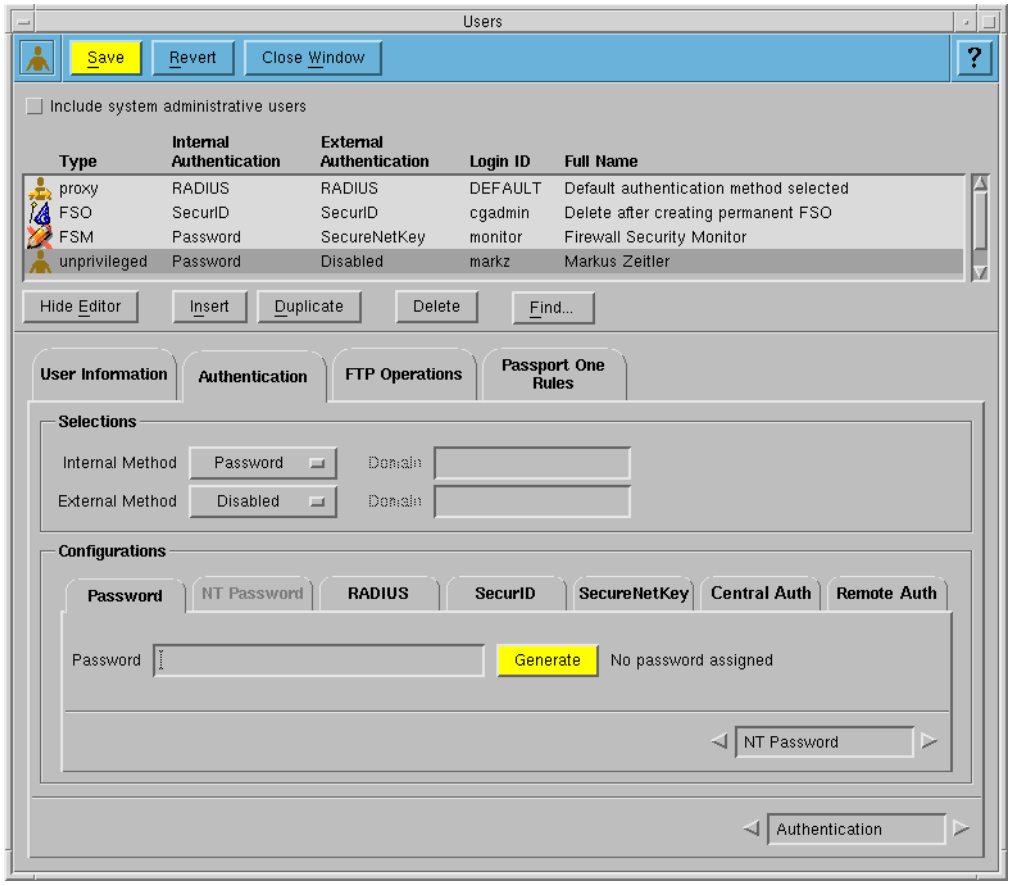


Figure II-63. Users Window (Expanded) - NT Password Authentication Page

CAUTION!

For security purposes, passwords *cannot be retrieved*. Memorize passwords and destroy all hard copies of passwords.

This page contains the following field:

Password — Allows a newly hand-entered password or displays a generated password. A valid password can be up to 256 characters. A suitable value in this field changes the password status to the right of the **Generate** button to **Has valid password**. It is not necessary to enter a password in this field if an NT domain will be performing authentication.

Generate — Assigns the user a valid password and displays the password in the **Password** field.

Note: Because the Central Manager does not know what software is installed on a target firewall or what type of firewall (UnixWare or Windows NT) comprises a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

RADIUS Page

If RADIUS is installed, this page displays the following configuration message, "Users using this method must be configured on its server." Otherwise, the tab is unselectable.

Note: Because the Central Manager does not know what software is installed on a target firewall or what type of firewall (UnixWare or Windows NT) comprises a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

See also:

- "RADIUS" on page II-150
- "How to Configure RADIUS" on page II-173

SecurID Page

If SecurID is installed, this page displays the following configuration message, "Users using this method must be configured on its server." Otherwise, the tab is unselectable.

Note: Because the Central Manager does not know what software is installed on a target firewall or what type of firewall (UnixWare or Windows NT) comprises a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

See also:

- "SecurID" on page II-152
- "How to Configure SecurID" on page II-180

SecureNetKey Page

If SecureNet Key is installed, this page displays the following configuration message, "Users using this method must be configured on its server." Otherwise, the tab is unselectable.

Note: Because the Central Manager does not know what software is installed on a target firewall or what type of firewall (UnixWare or Windows NT) comprises a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

See also:

- "SecureNet Key" on page II-152
- "How to Configure SecureNet Key" on page II-181

Central Authentication Page

This tab appears only if Central Authentication is configured; this page displays the following configuration message, "Users using this method must be configured on its server."

Note: Because the Central Manager does not know what software is installed on a target firewall or what type of firewall (UnixWare or Windows NT) comprises a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

See also:

- "Central Authentication" on page II-150
- "How to Configure Central Authentication" on page II-174

Remote Authentication Page

If RADIUS is installed and the **rmtauth(1M)** utility is run, this page displays the following configuration message, "Users using this method must be configured on its server." Otherwise, the tab is unselectable.

Note: Because the Central Manager does not know what software is installed on a target firewall or what type of firewall (UnixWare or Windows NT) comprises a target group, all Authentication pages are always active when configuring target groups. It is the administrator's responsibility to ensure the correct choices for target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

See also:

- "Remote Authentication" on page II-151
- "How to Configure Remote Authentication" on page II-177

Users - FTP Operations Page

Use this page of the expanded Users window to permit or deny individual FTP operations for a user. If you select the DEFAULT user and then edit this page, your selections become the default operations; therefore, the **Use defaults** check box and the **Edit Defaults** button are unselectable.

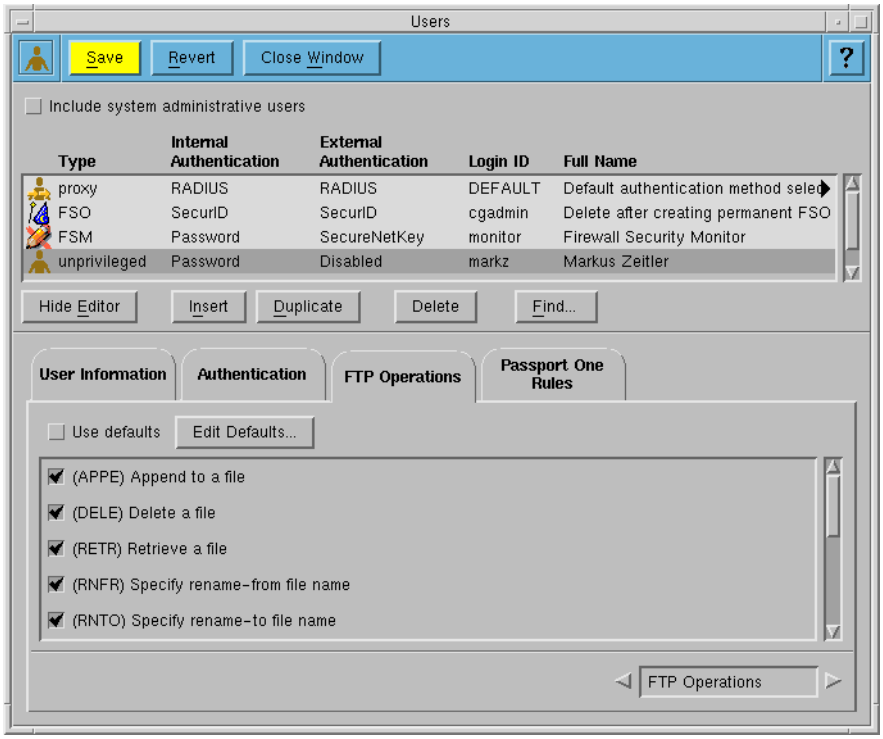


Figure II-64. Users Window (Expanded) - FTP Operations Page

Abbreviations that begin with an **X** are experimental operations that might not be supported by your FTP client program.

This page contains the following fields, push buttons, and controls:

Use defaults — Sets the FTP operations to those on the Default FTP Operations window. If you check this field and later change the default FTP operations, the new defaults will apply to this user. This check box is not selectable when editing FTP operations for the DEFAULT user (when you select the DEFAULT user from the user list and select the FTP Operations page, you are editing the defaults).

Edit Defaults Sets up a template for new users via the Default FTP Operations window. Editing the default FTP operations also changes the FTP operations for the DEFAULT user. This button is not active when editing FTP operations for the DEFAULT user (when you select the DEFAULT user from the user list and select the FTP Operations page, you are editing the defaults).

Note: This page is not active when configuring target groups. For further information about Central Management, see "Central Management Choices Window" on page I-124.

See also:

- "Default FTP Operations Window" on page II-169
- "How to Add or Change a User" on page II-170
- "File Transfer Protocol Proxy" on page III-21

Users - Passport One Rules Page

Use this page of the expanded Users window to assign Passport One rules to users.

You can establish Passport One profiles and rules for the DEFAULT user. These rules will then be used for both the DEFAULT user and for any known user who does not have Passport One rules defined.

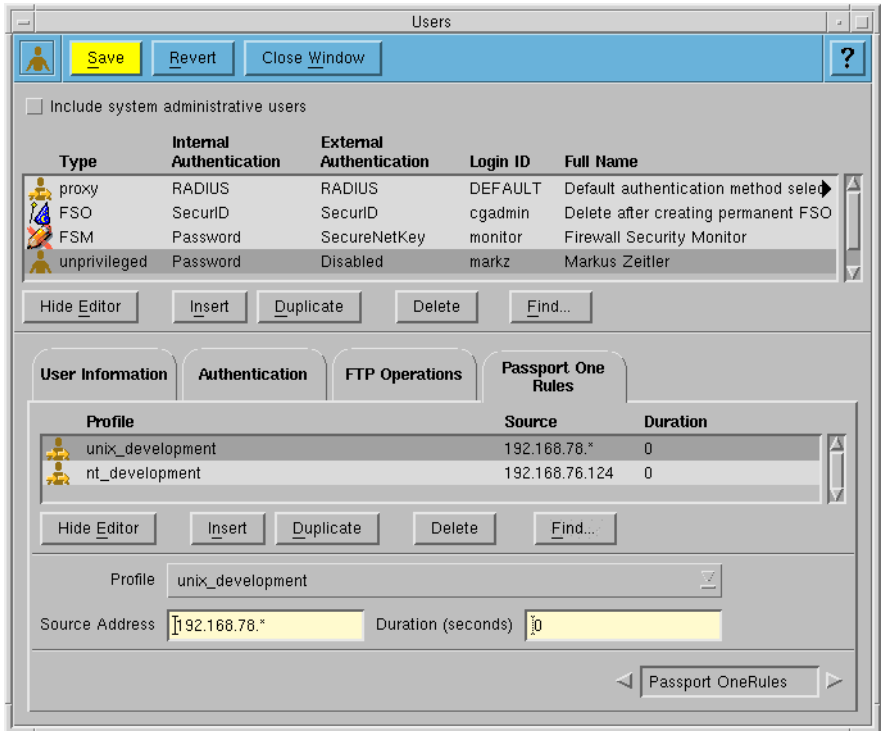


Figure II-65. Users Window (Expanded) - Passport One Rules Page

This page contains the following fields:

Profile	Name of the packet-filtering rules profile for the user.
Source Address	IP address or host name from which the user can make connections to Passport One. The wild card characters * and ? are accepted.
Duration (seconds)	Maximum duration for a Passport One session. A value of 0 indicates that no timeout is enforced.

This page is controlled with a unique set of accelerator keys:

Alt+\	Deselects all list items
Alt+a	Selects all list items
Alt+d	Duplicates the selected line after itself
Alt+e	Shows or hides editable fields
Alt+n	Inserts empty line after the first selected line; otherwise empty line is first

See also:

- "Accelerators" on page I-17
- "Passport One Window" on page II-190
- "Passport One Profiles Page" on page II-192
- "Passport One Rules Page" on page II-193

Default User Information Window

Use this window to create a template of default login information for FSO, FSM, and Unprivileged users. The template greatly simplifies adding these users to the system. This window does not apply to Proxy users or to the DEFAULT user.

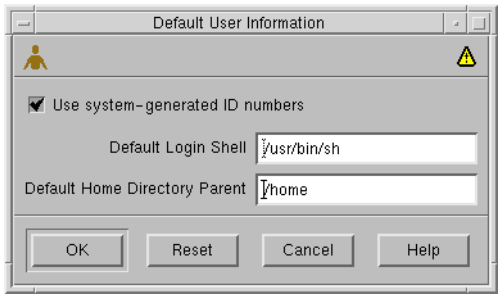


Figure II-66. Default User Information Window

This window contains the following fields, push buttons, and controls:

Use system-generated ID numbers
Assigns a user ID.

Default Home Directory Parent
Assigns the parent directory of the home directory.

Default Login Shell
Sets a default login shell.

OK Saves changes and closes the window.

Reset Discards unsaved changes and restores previous values.

Cancel/Close Resets and closes the window. If there are unsaved changes, this button is labeled **Cancel**; otherwise, it is labeled **Close**.

Help Displays online help for the window.

Note: Changes to these fields affect several fields in the User Information page.

See also:

- “Users - User Information Page” on page II-155
- “How to Set Defaults for New Users” on page II-172

Default FTP Operations Window

Use this window to create a template for default FTP operations. The template greatly simplifies setting FTP operations for all new users on the system. Changing options on this window changes the settings for the DEFAULT user.

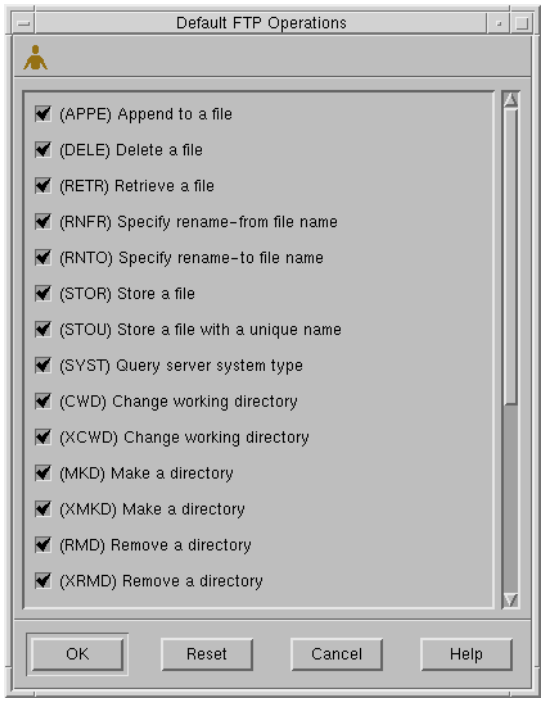


Figure II-67. Default FTP Operations Window

This window has most of the same fields as the FTP Operations page; it has the following push buttons:

OK	Saves changes and closes the window.
Reset	Discards unsaved changes and restores previous values.
Cancel/Close	Resets and closes the window. If there are unsaved changes, this button name is **Cancel**; otherwise, it is **Close**.
Help	Displays online help for the window.

See also:

- “Users - FTP Operations Page” on page II-165
- “How to Set Defaults for New Users” on page II-172

How to Add or Change a User

You can use the expanded Users window to add new users to your system and change existing users. For a secure system, you must be careful when adding new users to the system and granting privileges.

To display the expanded Users window:

1. Select **Configuration** from the Control Panel.
2. Select **Users**. The Users window appears.
3. Click on **Show Editor**. The expanded Users window appears.

To add a user:

1. Click on **Insert**. The list is scrolled to the end. An incomplete new line appears.
2. Type in the new user information on the User Information page.
3. Click on the **Authentication** tab.
4. Select authentication methods in the **Internal Authentication Method** and **External Authentication Method** field.
5. Click on the **FTP Operations** tab.
6. Check the individual FTP operations that you want to enable; remove the check from operations that you want to disable.
7. (Optional) To configure a user to use Passport One profiles, click on the **Passport One Rules** tab. The Passport One Rules page appears.
8. (Optional) Select a profile from the **Profile Name** list and type an address in the **Source Address** field and a time period in the **Session Duration** field.
9. Click on **Save**.

To change a user:

1. Select the user that you want to change.
2. Edit the fields that you want to change on each notebook page.
3. Click on **Save**. If the user changes from FSO to FSM or Unprivileged, the CyberGuard Firewall removes the user from all roles and removes the **network** and **sys_private** subdirectories and their contents. If the user type changed from FSO, FSM, or Unprivileged, to Proxy, the CyberGuard Firewall removes the user from all roles and removes the user's home directory and its contents.

How to Delete a User

You can use the Users window to delete users, files in their home directories, their home directories, and mail files.

Notes:

- After initial system configuration, ensure that an FSO user other than **cgadmin** exists, and delete **cgadmin**, a likely target for attacks.
- Delete FSO, FSM, and Unprivileged users only when their files are no longer on backup media. Instead, set the authentication method to **Disabled** to prevent users from logging in. When you delete a user, you also delete the files in the user's home directory, the home directory, and mail files.
- An FSO cannot delete his own ID.

To display the Users window:

1. Select **Configuration** from the Control Panel.
2. Select **Users**. The Users window appears.

To delete a user:

1. Select the user to delete. (You cannot delete yourself or users with ID numbers less than 99.)
2. Click on **Delete**.
3. Click on **Save**. The user's system definition and membership in administrative roles (e.g., FSO) are removed, and appropriate file changes occur.

How to Set Defaults for New Users

You can set defaults for new firewall and FSO users from the Default User Information window and you can set defaults for all users from the Default FTP Operations windows. These windows are accessed through the expanded Users window.

To display the expanded Users window:

1. Select **Configuration** from the Control Panel.
2. Select **Users**. The Users window appears.
3. Select a FSO, FSM, or Unprivileged user.
4. Click on **Show Editor**. The expanded Users window appears.

To set login defaults for new users:

1. Click on the **User Information** tab. The User Information page appears.
2. Click on **Edit Defaults**. The Default User Information window appears.
3. (Optional) Check **Use system-generated user ID numbers** to have your system assign the user IDs.
4. (Optional) Type a path in the **Default Login Shell** field.
5. (Optional) Type a path in the **Default Home Directory Parent** field.
6. Click on **OK**.

To set FTP operation defaults for new users:

1. Click on the **FTP Operations** tab. The FTP Operations page appears.
2. Click on **Edit Defaults**. The Default FTP Operations window appears.
3. Check the individual FTP operations that you want to enable as defaults for new users and old users who were configured using the default operations; remove the check from operations that you want to disable.
4. Click on **OK**.

How to Configure RADIUS

Before you can select RADIUS as an authentication method, you must install and configure several components.

To configure RADIUS authentication on the firewall:

1. Install and configure the primary RADIUS server. Optionally, configure the backup (secondary) RADIUS server. Installation and administration of the server is dependent on the vendor. During installation, make note of the following values to be used when configuring the CyberGuard Firewall RADIUS agent:

   - The "shared secret" key string
   - The IP address of the primary RADIUS Server
   - The IP address of the backup RADIUS Server
   - The Internet service port number of the RADIUS Server

2. Copy the **/etc/security/auth/radius.conf.template** file to the new name **/etc/security/auth/radius.conf** and change the file specifications as follows:

   owner: root
   group: sys
   mode: 0400
   security level: SYS_PUBLIC

   a. Change the security level with the following command:

      ```
      chlvl SYS_PUBLIC /etc/security/auth/radius.conf
      ```

   b. View file information as follows:

      ```
      ls -lz
      -r--------  2 root sys 512 May 8 11:14  \
      /etc/security/auth/radius.conf SYS_PUBLIC
      ```

3. Edit **/etc/security/auth/radius.conf** to configure the values obtained in Step 1 (**/etc/security/auth/radius.conf** is self-documented).

4. Define the **RADIUS** service port (the default port specified in RFC 2138 is 1812) in the **/etc/inet/services** file:

   ```
   radius   1812/udp   # RADIUS server authentication port
   ```

5. Add packet-filtering rules to the Packet-Filtering Rules window similar to the following to permit UDP connections to the RADIUS servers. Obtain the IP address and the service port number from the **/etc/security/auth/radius.conf** file. For example, if the primary RADIUS server IP address is `192.168.200.1`, the backup RADIUS server IP address is `192.168.200.2`, and the RADIUS service port is `1812`, add the following packet-filtering rules:

```
# Primary RADIUS Authentication Server
permit  1812/udp    FIREWALL    192.168.200.1   ENABLE_REPLY

# Secondary RADIUS Authentication Server
permit  1812/udp    FIREWALL    192.168.200.2   ENABLE_REPLY
```

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Window" on page II-22
- "RADIUS" on page II-150

How to Configure Central Authentication

Before you can select Central Authentication as an authentication method, you must install and configure several components. The command-line utility **centralauth** is used to configure Central Authentication. Refer to the **centralauth(1M)** online man page for complete details about this utility.

Note: For information about configuring LDAP for Central Authentication, see "LDAP Authentication Window" on page I-297 and the **ldapauth(1M)** man page.

To configure Central Authentication with RADIUS:

1. Install and configure the primary RADIUS server. Optionally, configure the backup (secondary) RADIUS server. Installation and administration of the server is dependent on the vendor. Use the following steps to configure the RADIUS Server(s) that are to be used for Central Authentication:

   a. Add the firewall as a RADIUS client, specifying the shared secret key that is to be used by that firewall client and the RADIUS server. This is the secret key that you will specify on the **centralauth** command line with the **-k** option.

   b. Add a Remote Access Policy that governs administrative users' (i.e., Firewall Security Officers or Monitors) access to the firewall. Before accessing the firewall's Remote Web Administration interface, a RADIUS server must be configured to return a valid firewall Trusted Facility Management (TFM) role, an organizational unit (OU), and optionally, a UNIX user ID (UID). These user properties are sent to the firewall by the RADIUS server after successful user authentication.

Use the following format to specify the TFM role:

`role=`*`TFM_role_name`*

Use the following format to specify the OU:

`ou=`*`organizational_unit_name`*

Use the following format to specify the UID:

`uid=`*`user_ID`*

Note: These properties are not case sensitive. The values assigned to the **role** and **ou** properties must not contain spaces or tabs. The value assigned to the optional **uid** property must be valid for a UNIX user account (a number between 100-59999). If no user ID is configured, one is selected automatically by Central Authentication.

When specifying these properties, you must separate them with a space, for example:

```
role=FSO ou=TEST
```

The properties are specified in a RADIUS profile that is associated with a particular user or group of users. Specifically, the RADIUS Reply-Message attribute is added to the profile. Upon successful authentication, the RADIUS server returns the Reply-Message attribute. The user's TFM role, OU, and UID properties are specified in the Reply-Message. For example, a Firewall Security Officer is a member of the FSO role in the firewall's TFM data base. To log in as a centrally authenticated FSO, the RADIUS Reply-Message attribute for the authenticated user must contain `role=FSO`. If the firewall is configured (by **centralauth**) as a part of the TEST OU, the reply message must contain the matching `ou=TEST` to be authorized access.

c. Add the users governed by the Remote Access Policy to the user data base associated with the RADIUS server.

d. During installation, make note of the following values to be used when configuring the Firewall RADIUS agent:

- IP address of the primary RADIUS server (ServerIP)
- "shared secret" key string (Key)
- IP address of the backup RADIUS server, if applicable (BackupIP)
- Internet service port number of the RADIUS servers (Port)
- Organizational Unit assigned to the centrally-authenticated administrators of the target firewall (OrgUnit).

2. Determine which authenticating application service is to be configured for Central Authentication. The default application is **telnetd**, which is used by Remote Web Administration. If an application other than the default is used, invoke the **centralauth** command with the **-a** option.

3. Determine the type of authentication rule (internal or external) for the application service. For Remote Web Administration, this is determined by the type of the network

interface associated with the fully qualified domain name (FQDN) of the firewall. The default type is internal.

4. Log in to the GUI, start a Shell Window, and become the root user with the following commands.

   ```
   /sbin/tfadmin newlvl SYS_PRIVATE
   su root
   ```

5. From the Shell Window, as the root user, run the **centralauth** utility using the data collected from Steps 1 through 3. Assume the following example data for the examples shown below:

   Primary RADIUS Server: 192.168.200.1
   Backup RADIUS Server: 192.168.200.2
   RADIUS service port: default (1812)
   Shared Secret Key: "SECRET KEY"
   Organizational Unit: SYSADMIN

   Example 1: The authenticating application service is Remote Web Administration. The authenticating rule type is internal.

   (one line)
   ```
   centralauth -i 192.168.25.170 -b 192.168.200.2 -k "SECRET KEY"
   -o SYSADMIN
   ```

   Example 2: The authenticating application service is Remote Web Administration. The authentication rule type is external. No backup RADIUS server is being used.

   ```
   centralauth -i 192.168.200.1 -k "SECRET KEY" -o SYSADMIN -x
   ```

6. Exit (log out of) the GUI. After running the **centralauth** command as shown above, CentralAuth appears as an authentication method in the Users Window.

Notes:

- The user must exit from the GUI after configuring or removing central authentication.
- The Remote Web Administration server is typically configured to connect via telnet to the firewall's fully-qualified domain name (FQDN). If the FQDN is associated with an external interface address on the firewall, authentication attempts to match authentication rules defined for external (inbound) interfaces. If the FQDN is associated with an internal interface address on the firewall, authentication attempts to match authentication rules defined for internal (outbound) interfaces.
- On High-Availability (HA) configurations, run **centralauth** on the primary (served) firewall in the HA pair. The **centralauth** configuration automatically propagates to the secondary (standby) firewall in the HA pair.

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Window" on page II-22
- "RADIUS" on page II-150

How to Configure Remote Authentication

The **rmtauth(1M)** utility provides a command-line interface that is used to configure Passport One group and VPN client configuration support using a RADIUS server.

Note: For information about configuring LDAP for Remote Authentication, see "LDAP Authentication Window" on page I-297 and the **ldapauth(1M)** man page.

To configure Passport One Remote Authentication with RADIUS:

RemoteAuth using RADIUS interprets type 191 of the CyberGuard (1457) vendor-specific attribute to be a Passport One Remote Group name. The user entry on the RADIUS server is configured with the user's remote group name placed in the Cyberguard-Group-ID (type 191) field of the CyberGuard (vendor ID 1457) vendor-specific attribute. This enables Passport One to select a profile with a matching name and apply that Passport One access profile to client connections for the user.

Configuring **rmtauth(1M)** for RADIUS adds the RemoteAuth method to the authentication module database, adds an application-service authentication rule for the Passport One (clasd) service, creates packet-filtering rules to access the RADIUS servers, and inserts RemoteAuth as a GUI authentication method. If rmtauth fails for any reason, the firewall configuration is restored to its previous state.

1. Modify the Radius Dictionary File on the RADIUS server by adding the RADIUS group-return data for the CyberGuard Vendor-Specific attribute:

   CyberGuard Vendor ID: 1457
   Attribute Name: CyberGuard-Group-ID
   Vendor Specific Attribute Type: 191
   Format of field value: string
   Restricted to be single-value attribute

2. Assign the RADIUS user to the Passport One group by selecting and configuring the CyberGuard-Group-ID attribute in the user's return list attributes. This is done from the RADIUS server administrator program. Failure to provide a properly formatted RADIUS attribute or providing a name that does not match a remote group name on the firewall will cause a failure to assign the Passport One access profile.

   Note: If a user entry is configured with multiple remote group memberships, Passport One will select a profile based on the first group name that matches. Care must be taken by both the firewall and RADIUS (or LDAP directory) administrators to resolve any ambiguity between the group memberships of the user record and the Passport One remote group names.

3. On the firewall, execute the following command to configure Passport One for the RADIUS-type RemoteAuth module:

   `rmtauth -i` *Server_IP_Address* **`-k`** *Firewall_Password*

where:

-i *Server_IP_Address* - Host name or IP address of the primary RADIUS Authentication Server.

-k *Firewall_Password* - Identifies the password known to the RADIUS server and the firewall RADIUS client.

This command configures the **/etc/security/auth/RemoteAuth.conf** file, and installs RemoteAuth as the default method for the clasd authentication service. Note that if users will be authenticating from an external interface, use the **-I** option to configure the interface to which the Passport One (clasd) application service authentication rule applies. (Internal is the default).

4. To add Passport One groups to the firewall configuration, add the groups names as a Remote Group types in the Users Window and configure their Passport One rules.

To configure VPN Client Configuration Remote Authentication with RADIUS:

There are four (4) CyberGuard vendor specific attribute types that define the VPN client internal network configuration. The following steps illustrate how to configure the RADIUS Server(s) used for VPN client address configuration.

1. The Radius Dictionary File, on the RADIUS server, must be modified to add the RADIUS definitions for the CyberGuard Vendor-Specific attributes:

   CyberGuard Vendor ID: 1457
   Format of field value: string
   Each is restricted to be single-value attribute
   Vendor-specific attribute type codes, RADIUS attribute names, and corresponding IKECFG attribute names are as follows:

Type Code	RADIUS Attribute Name	IKECFG Attribute Name
161	CyberGuard-VPN-Address	INTERNAL_IP4_ADDRESS
162	CyberGuard-VPN-Netmask	INTERNAL_IP4_ADDRESS
163	CyberGuard-VPN-DNS	INTERNAL_IP4_DNS
164	CyberGuard-VPN-WINS	INTERNAL_IP4_NBNS

2. The IKECFG network attributes are assigned by selecting and configuring the CyberGuard vendor-types. This is done from the RADIUS server administration program.
3. On the firewall:
   a. Use the **rmtauth** command to configure the VPN Policy Manager for the RADIUS-type RemoteAuth module. For example:

```
rmtauth -i 192.168.1.100 -k secret  -a vpnguard
```

This command configures the **/etc/security/auth/RemoteAuth.conf** file and installs RemoteAuth as the default method for the vpnguard application. Note: If users will be authenticating from an external interface, use the **-I** option to configure interface to which the RemoteAuth method applies (internal is the default).

b. In the VPN Client Configuration window, create a VPN client configuration and check the **Remotely Assigned During XAUTH Authentication** check box.

c. In the IKE Advanced Settings dialog window, accessed from the VPN Secure Channels window, check the **Use Extended Authentication (XAUTH)** check box.

d. In the IKE Advanced Settings dialog window, accessed from the VPN Secure Channels window, select the VPN Client Configuration that was configured in Step 3b.

Notes:

- The user must exit from the GUI after configuring or removing remote authentication.
- If a user entry is configured with multiple remote group membership, Passport One will select a profile based on the first group name that matches. Care must be taken by both the firewall and RADIUS or LDAP directory administrators to resolve any ambiguity between the group memberships of the user record and the Passport One remote group names.
- On High-Availability (HA) configurations, run **rmtauth** on the primary (served) firewall in the HA pair. The **rmtauth** configuration automatically propagates to the secondary (standby) firewall in the HA pair.
- The **cg_dbadm(1M)** utility may be used to view the underlying authentication rule configuration. Use **cg_dbadm -b svc** to see that clasd service rule is using RemoteAuth. Use **cg_dbadm -b am** to see how the RemoteAuth authentication method is configured.
- Use **cgia** to test authentication from the command line. You must be root to run this command. You must be at NETWORK level to test authentication connections to RADIUS or LDAP servers.
- Adding **Debug 9** on a line in the **/etc/security/firewall/clas/clasd.conf** file writes debug output to **/var/tmp/clasd.**<*pid*>. You must be at NETWORK level (**/var/tmp** is an MLD). This shows the user/group lookup as it occurs.

See also:

- **rmtauth(1M)** manual page
- “Packet-Filtering Rules Window” on page II-22
- “Remote Authentication” on page II-151
- “LDAP Authentication Window” on page I-297

How to Configure SecurID

Before you can select SecurID as an authentication method, you must install and configure several components.

To configure SecurID authentication on the firewall:

1. Install and configure the ACE/Server (and optional slave server) software on the appropriate system(s) using the procedure in the ACE/Server release notes and the *ACE/Server Installation and Configuration Guide*. Refer to the *ACE/Server Administration Manual* for details on adding firewall users and the firewall client to the authentication server database.

   When configuring the firewall as a client, select **communications server** as the client type.

2. Copy the **sdconf.rec** file from the authentication server's VAR_ACE directory (e.g., `VAR_ACE=/var/ace`) to **/etc/security/auth/sdconf.rec** on the firewall. The **sdconf.rec** file can be loaded using a tape device or **ftp**. The file must be owned by **root** and should have owner read-only privilege.

3. Issue the **sdinfo(1)** command on the ACE/Server master (e.g., `/usr/ace/sdinfo`) to obtain the master IP address, slave IP address, and service port number. For example:

   ```
   MASTER SERVER ADDRESS    192.168.200.1
   SLAVE NET ADDRESS        192.168.200.2
   AUTHENTICATION SERVICE     securid
   PORT NUMBER                5500
   ```

4. Define the **SecurID** service ports in the **/etc/inet/services** file. The default ports chosen by RSA Security, Inc. are as follows:

   ```
   securid      5500/udp   # ACE/Server Master (SecurID)
   securidprop  5510/udp   # ACE/Server Slave (SecurID)
   ```

5. Add packet-filtering rules to the Packet-Filtering Rules window similar to the following example to permit UDP connection to the ACE/Server master, and optionally to the slave server systems:

   ```
   # ACE/Server Master
   permit 5500/udp  FIREWALL  192.168.200.1  ENABLE_REPLY
   # ACE/Server Slave
   permit 5510/udp  FIREWALL  192.168.200.2  ENABLE_REPLY
   ```

Notes:

- The node name of the firewall (i.e., `uname -n`) must be an alias in the firewall's **/etc/inet/hosts** file for the IP address that is configured at the Ace/Server. Remember that host name aliases should be unique within the **/etc/inet/hosts** file.
- The Ace/Server should be configured with DCE enabled.
- A "node secret" file, **/etc/security/auth/securid**, is sent to the firewall during the initial authentication session. The **Sent Node Secret** check box on the Client Configuration/Edit window of the ACE/Server administration program indicates if the node secret file has been sent to the client (the firewall). If this box is checked and the node secret file does not exist on the firewall, authentication will fail. If this occurs, uncheck the **Sent Node Secret** check box to allow a new node secret to be sent to the firewall.

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Window" on page II-22
- "SecurID" on page II-152

How to Configure SecureNet Key

Before you can select SecureNet Key as an authentication method, you must install and configure several components.

To configure SecureNet Key authentication on the firewall:

1. Install and configure the DSS and WinDMS software on the appropriate system. Installation and administration of the server is explained in the documentation provided by AXENT Technologies. During installation, make note of the following values to be used when configuring the CyberGuard Firewall DSS agent software:
   - The agent ID name created for the firewall
   - The 16 hexadecimal digit key value assigned to the firewall agent
   - The IP address of the AssureNet Pathways Defender Security Server
   - The Internet service port number of the AssureNet Pathways Defender Security Server
2. Copy the **/etc/security/auth/snk_agent.cf.template** file to the new name **/etc/security/auth/snk_agent.cf** and change the file specifications as follows:

   owner: root
   group: sys
   mode: 0400
   security level: SYS_PUBLIC

a. Change the security level with the following command:

```
chlvl SYS_PUBLIC snk_agent.cf
```

b. View file information as follows:

```
ls -lz
-r--------  2 root sys 512 May 8 11:14  \
/etc/security/auth/snk_agent.cf SYS_PUBLIC
```

3. Edit **/etc/security/auth/snk_agent.cf** to configure the values obtained in Step 1 (**/etc/security/auth/snk_agent.cf** is self-documented).

4. Define the **SecureNet Key** service port (default port chosen by DSS is `2626`) in the **/etc/inet/services** file:

```
securnetkey   2626/tcp   # SecureNetKey port
```

5. Add packet-filtering rules to the Packet-Filtering Rules window similar to the following to permit TCP connection to the DSS system. Obtain the IP address and the service port number from the **/etc/security/auth/snk_agent.cf** file. For example, if the DSS IP address is `192.168.200.1`, and the DSS service port is `2626`, add the following packet-filtering rule:

```
# Defender Security Server (SecureNet Key token authentication)
permit  2626/tcp    FIREWALL    192.168.200.1
```

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Network Services File (services)" on page II-40
- "SecureNet Key" on page II-152

Users - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

The CyberGuard Firewall supports two types of identification and authentication databases: the UnixWare Identification and Authentication Database (IADB) and the CyberGuard Database (CGDB). User records, password records, and Authentication Module (AM) records are maintained in separate CyberGuard Databases.

Users who require accounts on the firewall (FSO, FSM, and Unprivileged) have records in both the IADB and the CGDBs. Proxy users, who do not have accounts on the firewall, have records only in CGDBs.

You can use the **useradd(1M)**, **usermod(1M)**, **userdel(1M)**, **passwd(1)** commands to modify FSO, FSM, and Unprivileged user records in the UnixWare IADB. Refer to the online manual pages of these commands for complete implementation details.

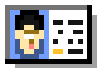
The **cg_dbadm(1M)** utility is used to import users during firewall installation. This command is intended as an installation and debug tool only. Modifying CyberGuard Database files with this command is **strongly discouraged**. Refer to the **cg_dbadm(1M)** online manual page for more information about this utility.

Note: Users added with the **useradd** command must also be added to the CGDB user database using the **cg_dbadm** command; otherwise, the Users Window will not function properly.

In the absence of the User CGDB or an authentication module:

The Identification and Authentication system of the CyberGuard Firewall will operate in a remedial mode in the absence of the User CGDB or an authentication module. Without a valid database or a selected authentication module, the login scheme (used for console modules) will use the standard UnixWare IADB interface. After CGIA authentication verification failure, an “Internal ERROR” message is displayed by the login scheme on the console and the standard UnixWare IADB password dialog is used: the FSO is prompted for a password and the password entered is matched with the redundant copy stored in the shadow password file. This allows the firewall administrator to login to the system to perform recovery procedures. Note that this method works only for the console login. When the GUI is running on the console, the FSO gains access to the console login by typing Alt+Sys-Req+P.

Chapter 9
Passport One



Passport One provides authorization of multiple service connections through the firewall contingent on a single, successful authentication session. Access rules for the authenticated user are applied for the duration of the session.

Passport One requires an authenticating client (HTTP, SSL, or Telnet) to create a session with the firewall. An HTTP or SSL (HTTPS) client must use an authenticating browser such as Netscape Navigator or Microsoft Internet Explorer. After authenticating the user, Passport One adds packet-filtering rules according to the user's configured profile. These rules are active only as long as the authenticating client session remains connected.

A typical session consists of the following steps:

1. The user connects to the firewall on the dedicated Passport One port.
2. Passport One accepts the connection and queries the user for identification and authentication.
3. If authentication is successful, Passport One generates administrator-defined packet-filtering rules, sends an acceptance reply, and maintains the connection. If authentication is unsuccessful, Passport One returns a denial message.
4. Leaving the Passport One connection open, the user opens one or more connections within the parameters of the packet-filtering rules in place from Passport One.
5. When the user closes the connection, Passport One removes the packet-filtering rules.

Passport One can also be used to authenticate and give unique access profiles through the firewall to different groups of users on a RADIUS server. See "Remote Authentication" on page II-151.

Auditing for Passport One is enabled on the Activities page of the Alerts and Activities window with the **Passport One activity** field and stored in the **Passport One activity** report.

Notes:

- Passport One was previously known as Client Authentication or Client-Level Authentication Service (CLAS). Some file and command names continue to reflect this.
- Only one authentication connection per IP address will be permitted at a time.

CAUTION!

When a client connected to Passport One disconnects without sending an EOF or FIN, the authentication connection will be left in a half-open state for up to 2 hours and 12.5 minutes. During this time, the user's rules will remain active and further login attempts will return an "Already Connected" message. Setting certain network tunable parameters to their minimum values can resolve this issue. For complete details and instructions, see "TCP Parameters Associated with Passport One" on page I-338.

NT Authentication Detection

The NT Authentication Detection (NTAD) feature monitors NT authentication traffic between Microsoft Windows NT clients and NT Primary Domain Controllers (PDCs). NTAD adds a layer of security on top of regular NT domain authentication and identification.

NT Domain Authentication provides authorization of multiple service connections though the firewall, contingent upon a single, successful authentication session. NT Authentication Detection allows access from an NT client to the Primary Domain Controller (PDC) only if the client has successfully authenticated with the PDC.

Access rules for the authenticated user are applied to the connecting system for the duration of the session and are removed upon termination of the session. Access is mediated during the authenticated session so that no direct connections are permitted between the PDCs and NT Clients at any time.

NTAD uses UDP ports 137 and 138 for monitoring NT authentication traffic. These ports are used to register the Netbios name of the NT Client and the WINS server, which often resides on the PDC. NTAD uses TCP port 139 to detect the authentication of NT Client with the domain that is running on the PDC. Packet-filtering rules such as the following can be added automatically by the firewall or manually by the administrator to allow NTAD:

```
permit  137-138/udp   Client    PDC      enable_reply
proxy   139/tcp       Client    PDC
permit  137-138/udp   PDC       Client   enable_reply
permit  139/tcp       PDC       Client   enable_reply
```

Client can refer to a single IP address or host name identifying a client workstation or a group of clients. *PDC* refers to the IP address or host name of a single PDC or group of PDCs.

For large domains, the clients and PDCs can be grouped together and specific members assigned to them using the Grouping window. The group names of PDC and CLIENTS, for example, can then be used in the Rules page of the Passport One window to assign similar access to groups of clients.

Auditing for NTAD is enabled on the Activities page of the Alerts and Activities window with the **Passport One activity** field and stored in the **Passport One activity** report.

NT Share Authentication Detection

NT Authentication Detection (NTAD) provides a mechanism for detecting file access within the directory of the specified share name. If the contents of a file are successfully accessed, the file name is treated as if an user has just authenticated. After successful access has been detected, NTAD adds packet-filtering rules according to the configured profile. Access rules for the "authenticated" user are applied to the connecting system for the duration of the access to the specified share name.

NTAD monitors traffic over TCP port 139 to accomplish the access check.

Note that the DEFAULT user is not used for NT Share Authentication Detection.

NTAD requires the following a persistent connection for the authorized duration. To ensure that the access to the share name is not timed out by NT, the use of **`net use \\SERVER\sharename`** is recommended.

The following is an example set of packet-filtering rules that need to added before NTAD will be able to detect NT Authentication requests correctly.

```
proxy   139/tcp      client  server
# The following rules may not be needed
# for SERVER <--> PDC authentication
permit  137-138/udp   server  PDC     enable_reply
permit  137-138/udp   PDC     server   enable_reply
permit  139/tcp       PDC     server
permit  139/tcp       server  PDC
```

Note that the last four rules describe the authentication paths that the server and PDC may need to use to confirm that the user is currently authenticated on the client and has access to the file name in \\SERVER\sharename.

Auditing for NT Share Authentication Detection is enabled on the Activities page of the Alerts and Activities window with the **Passport One activity** field and stored in the **Passport One activity** report.

CAUTION!

NT Share Authentication Detection is a control share only. Users should not have write permission into that directory.

SSL and X.509 Certificate Technology

The Secure Sockets Layer (SSL) protocol (also called HTTPS) provides a method of encapsulating data to allow privacy between two applications communicating over the Internet. SSL fragments data into blocks, compresses and encrypts the data blocks, and then transmits the data. SSL provides optional authentication between the client and the server using X.509 certificate technology.

An X.509 certificate is a number of pieces of information, which have been digitally signed by a trusted third-party called a Certification Authority (CA). *Digitally signed* means that a digest or summary of the information is computed and then encrypted with the CA's private key. The signature can be verified by recomputing the digest and comparing it to the results of the decrypted signature using the CA's (previously known) public key.

SSL is an application-level protocol and requires special server and client software. The Netscape and Microsoft Web browser clients include SSL functionality through SSLv3.

Note: The Passport One binary application uses a statically-linked SSL library that is not shipped with the CyberGuard Firewall product. Therefore, this library is not available for inclusion with or access by other applications.

SSL and Passport One

The HTTPS port can be used for Passport One in one of the following ways:

- Without SSL client authentication (encryption only)
- With SSLv3 client authentication, using X.509 certificates

The first mode provides encrypted login capability without certificates. The second mode requires clients to have a valid certificate, and allows users to specify a single Passport One profile for all clients with certificates issued by trusted Certification Authorities.

When the encryption-only mode is used, the client user will see an "encrypted page" notice when connecting. When the client certificate authentication mode is active, the client user is prompted for a certificate and is then shown the accept or deny page according to the acceptance of the certificate.

Notes:

- The encryption capabilities of SSL when used in Passport One apply only to the encryption of the authentication web pages served by Passport One and does not apply to the firewall sessions associated with an authenticated user's profile.
- There is no longer a distinction between domestic and export encryption for Passport One with SSL. Only the strong cryptography (formerly "domestic") version is now offered. This version is capable of symmetric encryption with 128-bit keys. The default length for keys in certificate requests is 1024 bits.

CAUTION!

The Client Certificate Authentication feature of Passport One is intended to be used only by sites that control their own Certification Authority.

When the certificate authentication mechanism in Passport One checks a client certificate, it verifies only that 1) The client certificate was signed by one of the trusted CAs, and 2) The current date/time falls within the validity period of the client certificate. It is not able to distinguish a particular certificate user attempting to authenticate using SSL.

A client certificate issued by a publicly accessible Certification Authority (such as VeriSign™, Thawte, etc.) is signed with the same private key as all other such certificates. Thus, if the issuer certificate of such a Certification Authority is trusted for authentication with Passport One, any holder of a certificate issued by that Certification Authority could successfully authenticate with Passport One.

This issue will be addressed in a future release of Passport One.

The following steps explain how to set up SSL with the Client Certification Authentication feature to work with Passport One:

1. If the Client Certificate Authentication feature is to be used, obtain copies of the issuer certificates and import them into the Certificate Management window.
2. Use the Certificate Request Wizard to create a key pair and a PKCS10 Certificate Signing Request (CSR).
3. Send the CSR to the chosen CA.
4. Retrieve the resulting SSL server certificate from the CA.
5. Import the certificate using the Certificate Management window.
6. Enable and configure Passport One from the GUI. In the Passport One window, go to the SSL page and select the SSL server certificate from the **Firewall SSL Keypair** drop-down list.

See also:

- "Certificate Request Wizard" on page II-290
- "Certificate Management Window" on page II-292

Passport One Window

Use this window to configure Passport One. The Passport One window has the following notebook pages: Setup, Profiles, Rules, NT Share Detection, and SSL (if licensed).

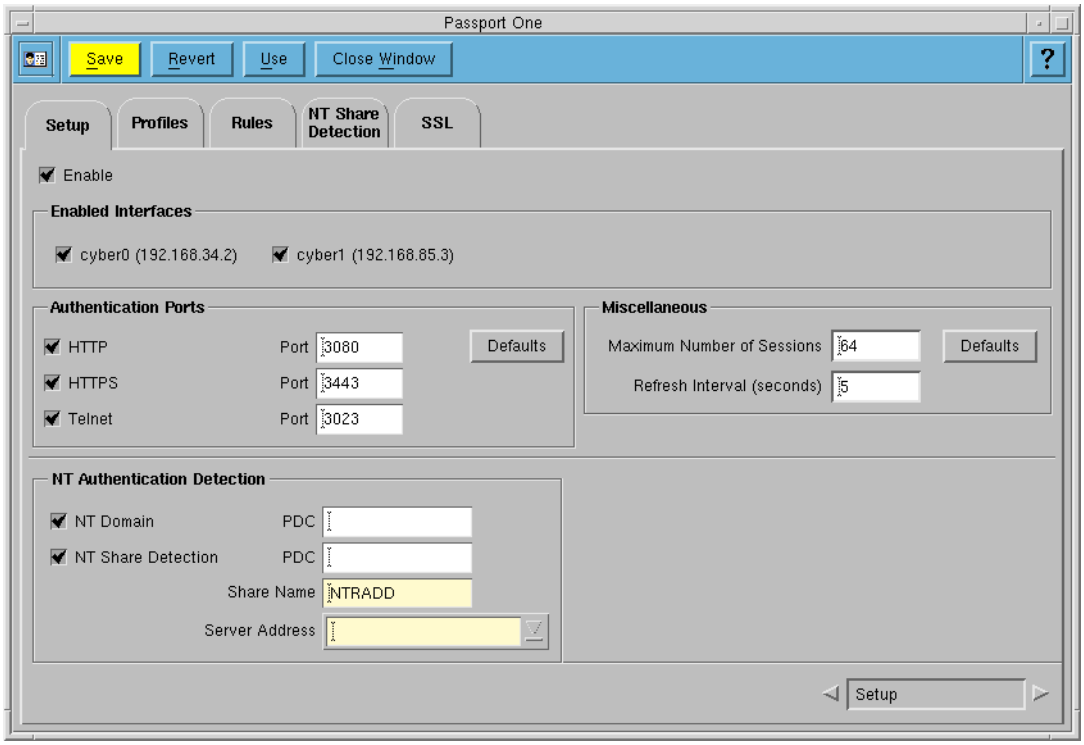


Figure II-68. Passport One Window - Setup Page

Passport One Setup Page

Use this page of the Passport One window to enable Passport One, define its interfaces, authentication ports, maximum number of sessions, and packet-filtering rule refresh period.

This page contains the following fields and controls:

Enable Enables Passport One. The default is disabled.

Enabled Interfaces
Enables Passport One on the specified interface. All available network interfaces will be listed. At least one interface must be checked if **Enable** is checked.

HTTP Enables Passport One through HTTP. The default is enabled.

Port Port number on which the Passport One daemon listens for HTTP connection requests. The default is 3080.

HTTPS Enables Passport One through HTTPS (HTTP over SSL). The default is disabled.

Port Port number on which the Passport One daemon listens for HTTPS connection requests. The default is 3443.

Telnet Enables Passport One through Telnet. The default is enabled.

Port Port number on which the Passport One daemon listens for Telnet connection requests. The default is 3023.

NT Domain Monitors NT authentication traffic between NT clients and the Primary Domain Controller (PDC). Adds an additional layer of security on top of NT domain authentication and identification by allowing access from a client to PDC only if the client has successfully authenticated with the PDC.

PDC IP address, host name, or group name of the Primary Domain Controller. If a value is entered in this field and NT Domain is checked, packet-filtering rules allowing the authenticating connection are automatically added. If this field is left empty, packet-filtering rules must be added manually.

NT Share Detection
Enables Passport One to detect file accesses within the directory of the specified share name.

PDC IP address, host name, or group name of the Primary Domain Controller. If a value is entered in this field and NT Share Detection is checked, packet-filtering rules allowing the authenticating connection are automatically added. If this field is left empty, packet-filtering rules must be added manually.

Share Name Name of the share that NTAD will monitor for file access.

Server Address
IP address of the server exporting the share name.

Defaults Resets the values in the HTTP, HTTPS, and Telnet **Port** fields to their defaults and enables Passport One through the ports.

Maximum Number of Sessions
Maximum number of simultaneous Passport One sessions. The default is 64.

Refresh Interval (seconds)
Frequency in seconds that the Passport One daemon will check if packet-filtering rules need to be refreshed to maintain the connection. The default is 5.

Defaults Resets the values in the **Maximum Number of Sessions** and **Refresh Interval (seconds)** fields to their defaults.

See also:

- "Network Interfaces Window" on page I-68
- "Hypertext Transfer Protocol Proxy" on page III-67
- "Secure Sockets Layer Protocol Proxy" on page III-237
- "Telnet Network Login Proxy" on page III-251

Passport One Profiles Page

Use this page of the Passport One window to view, add, change, or delete profiles.

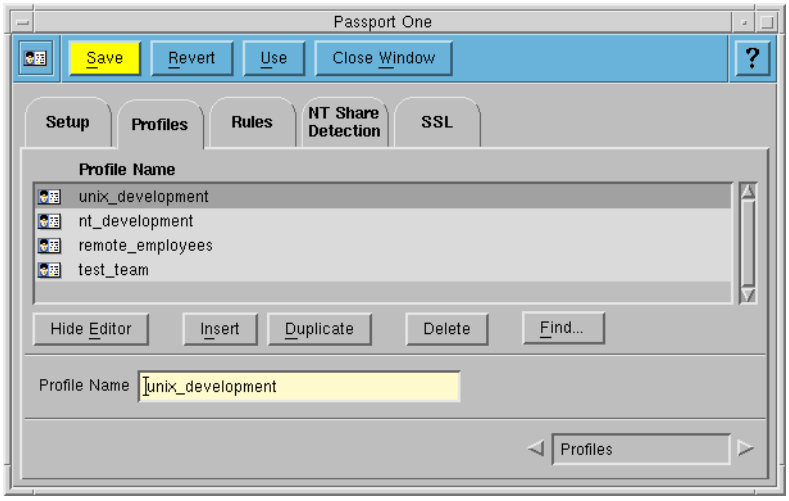


Figure II-69. Passport One Window - Profiles Page (Expanded)

This page contains the following field:

Profile Name Name of the profile that contains the packet-filtering rules corresponding to a user's access attributes. These rules are added at the beginning of a Passport One or NTAD session and removed at the end of a Passport One or NTAD session. Many profiles can exist, and several users can share a profile. Profiles appear in alphabetical order.

Note: When a user modifies the name of a Passport One profile, the name of the profile is not updated in the **Profile Name** field on the NT Share Detection page. The names are also not updated in the profiles used by users.

See also "How to Configure Network Interfaces" on page I-73.

Passport One Rules Page

Use this page of the Passport One window to view, add, change, or delete packet-filtering rules for profiles.

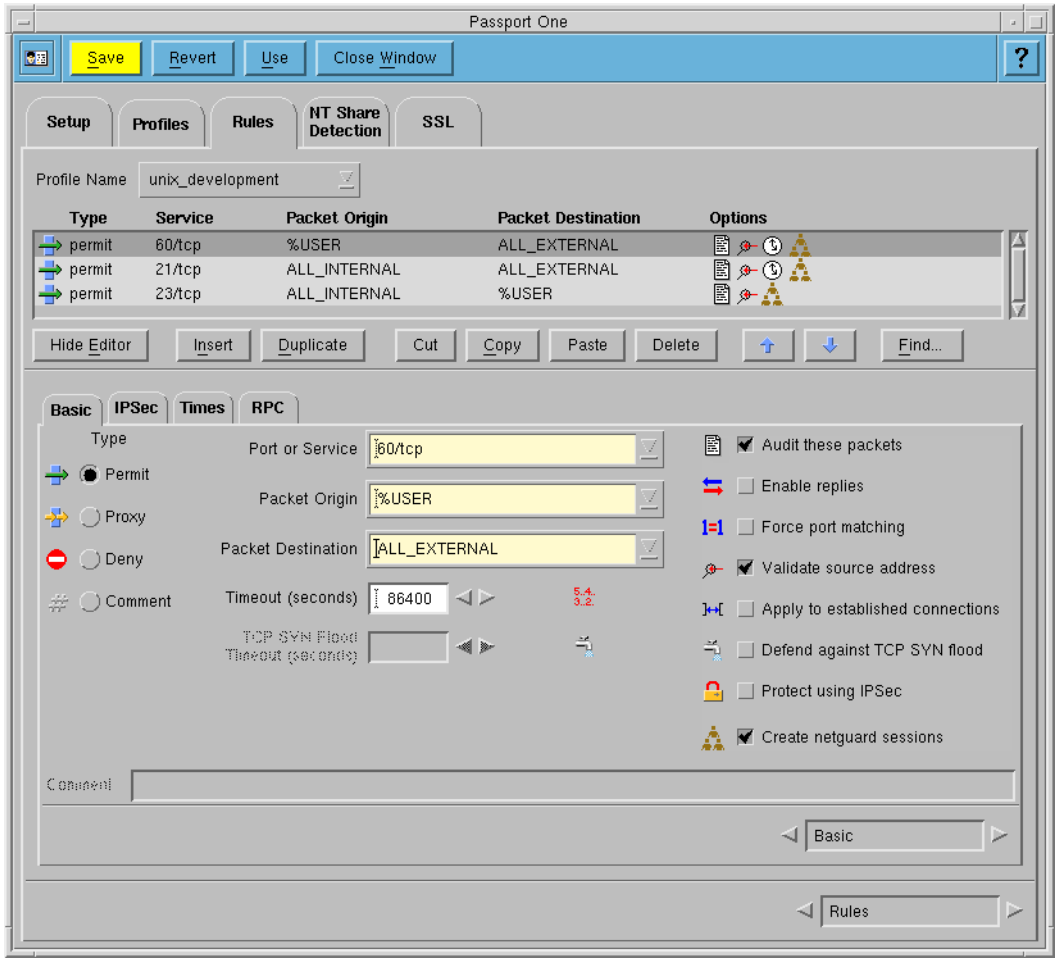


Figure II-70. Passport One Window - Rules Page (Expanded)

This page contains the following fields:

Profile Name — Name of the Passport One or NTAD profile from the Profiles page.

The expanded version of this page is identical to the expanded "Packet-Filtering Rules Window" on page II-22 except for one additional keyword in the **Packet Origin** and **Packet Destination** lists:

%USER — The source IP address of the system from which the user made the authenticating connection.

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Users - Passport One Rules Page" on page II-166

Passport One NT Share Detection Page

Use this page of the Passport One window to set up NT Authentication Detection (NTAD) to detect file access within the directory of the specified share name.

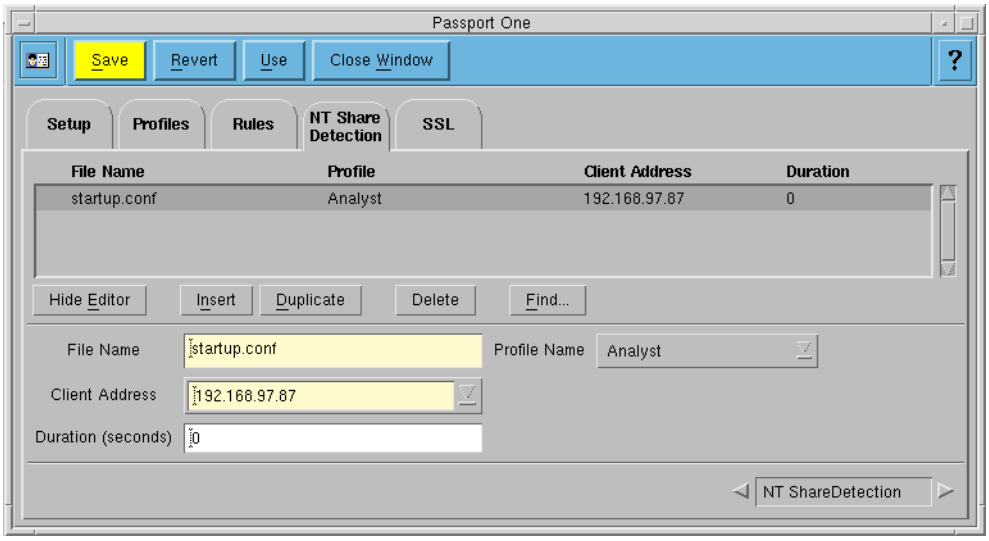


Figure II-71. Passport One Window - NT Share Detection Page (Expanded)

This page contains the following fields and controls:

File Name Name of the file in the share name to which this rule applies. This name must be unique.

Profile Name Profile file to use for this rule.

Client Address Source IP address from which the user can make connections. The wild card characters ***** and **?** are recognized. Note that when NT share detection client addresses contain wild card characters, the user must add the correct packet-filtering rules for the clients on the Packet-Filtering Rules window.

Duration (seconds) Session timeout in seconds. Zero indicates no time limit.

Note: When a user modifies the name of a Passport One profile, the name of the profile is not updated in the **Profile Name** field on the NT Share Detection page.

Passport One SSL Page

Use this page of the Passport One window to set up SSL to be used with or without certificates. (This page is deactivated if the optional SSL support for Passport One is not licensed.)

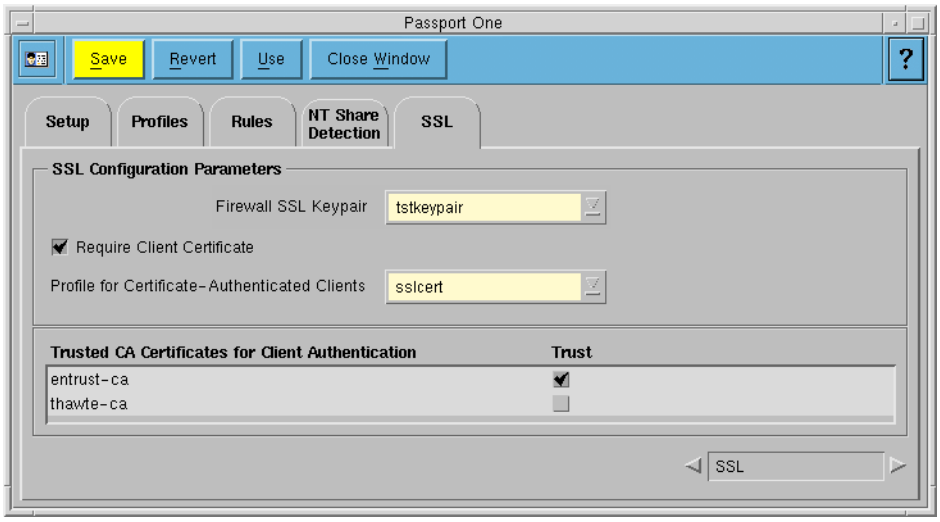


Figure II-72. Passport One Window - SSL Page

This page contains the following fields and controls:

Firewall SSL Keypair
List of firewall keypairs that are imported through the Certificate Management window.

Require Client Certificate
Indicates whether certificates are required for SSL authentication. The default is disabled.

Profile for Certificate-Authenticated Client
Name of the profile used for clients authenticated by the CA. This profile is used to generate packet-filtering rules for all sessions that authenticate with client certificates.

Trusted CA Certificates for Client Authentication
List of CA certificates that are imported through the Certificate Management window. These certificates are used to send a Certificate Request message in the SSL handshakes. This list determines which client certificates will be accepted by Passport One.

Trust
Indicates whether the corresponding issuer certificate is to be trusted for client authentication.

Note: The Client Certificate Authentication feature of Passport One is intended to be used only by sites that control their own Certification Authority. See the Caution statement in "SSL and Passport One" on page II-188.

See also:

- "How to Configure Network Interfaces" on page I-73
- "Certificate Management Window" on page II-292

Passport One Authentication Forms for HTTP Connections

When the user connects with an HTTP authenticating client, the following HTML files step through the authentication process. These files are located in the **/etc/security/firewall/clas/** directory. You may revise the files with your own messages.

login.html	Prompts for a user name.
challenge.html	Prompts for authentication based on the authentication method in use.
accept.html	Displays a connection acceptance notice.
deny.html	Displays a connection refusal notice.
ClientCertAccept.html	Immediately displays if a client certificate has been authenticated.

Variable keywords can be used in each of the HTML files listed above.

%LOGIN	User's login name.
%CHALLENGE	Challenge message.
%ADDR	Client IP address.
%SESNUM	Number of active sessions.

Notes:

- Certain versions of Internet Explorer™ and Netscape Navigator® will time out while the Passport One connection is active. The HTTP browser disconnects its connection to the firewall, and the user's Passport One Session is terminated. The firewall can prevent this from happening by periodically renewing the browser connection with Passport One to preserve the session. JavaScript™ must be enabled on the browser for this feature to work properly. If JavaScript is disabled, the browser time-out problem will still occur.

- Clicking the **Stop** icon on the browser icon does not guarantee that the Passport One session will be terminated. Instead, a button displayed on the Passport One Accept Page should be used to log out from the session. Additionally, leaving the Accept Page or closing the browser will terminate the Passport One session.
- See "How to Configure Authenticating Browsers for the HTTP Proxy" on page III-96 for information about configuring your browser.

How to Configure Passport One Profiles

You can use the Passport One Profiles page to add or change profile names for Passport One users. Profiles appear in alphabetical order.

To display the expanded Profiles page:

1. Select **Configuration** from the Control Panel.
2. Select **Passport One**. The Passport One window appears.
3. Click on the **Profiles** tab.
4. Click on **Show Editor**. The expanded Passport One Profiles page appears.

To add a profile:

1. Click on **Insert**. An incomplete new line appears in the list.
2. Type a new profile name in the **Profile Name** field.
3. Click on **Save**.

To change a profile name:

1. Select the profile that you want to change.
2. Edit the **Profile Name** field.
3. Click on **Save**.

To delete a profile name:

1. Select the profile name that you want to delete.
2. Click on **Delete**. The selected lines are removed from the list.
3. Click on **Save**.

Note: When a user modifies the name of a Passport One profile, the name of the profile is not updated in the **Profile Name** field on the NT Share Detection page. The names are also not updated in the profiles used by users.

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Packet Origins and Destinations" on page II-26
- "Users - Passport One Rules Page" on page II-166

How to Configure Passport One Profile Rules

You can use the expanded Passport One Rules page to configure packet-filtering rules profiles for Passport One users.

To display the expanded Rules page:

1. Select **Configuration** from the Control Panel.
2. Select **Passport One**. The Passport One window appears.
3. Click on the **Rules** tab.
4. Click on **Show Editor**. The expanded Passport One Rules page appears.

To add a packet-filtering rule to a profile:

1. Select the profile you want to change from the **Profile Name** field.
2. (Optional) Select the rule that you want the new rule to follow. (Skip this step if you want to add a new rule at the top of the list.)
3. Click on **Insert**. An incomplete new line appears in the list. The **Type** field is set to **Permit**.
4. Select **Permit**, **Proxy**, or **Deny** in the **Type** field.
5. Select or type the port number or service name and the protocol to which to apply the rule. The selected entry appears in the **Port or Service** field.
6. Select or type an originating host in the **Packet Origin** field. Select **%USER** to use the Source Address from the Passport One Rules page of the Users window.
7. Select or type a destination host in the **Packet Destination** field. Select **%USER** to use the Source Address from the Passport One Rules page of the Users window.
8. (Optional) Select a value in the **Timeout (seconds)** field for your network connection.
9. Check the **Options** check boxes that apply to this network connection.
10. Click on **Save**.

To change a packet-filtering rule:

1. Select the profile that you want to change from the **Profile Name** field.
2. Select the rule that you want to change.
3. Edit the fields that you want to change.
4. Click on **Save**.

To delete a packet-filtering rule:

1. Select the profile that you want to change from the **Profile Name** field.
2. Select the rule that you want to delete. The selected lines are removed from the list.
3. Click on **Save**.

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Packet Origins and Destinations" on page II-26
- "Users - Passport One Rules Page" on page II-166

How to Assign Passport One Profiles to Users

You can use the Users window to assign users to Passport One profiles and rules defined on the Passport One window:

To display the Passport One Rules page

1. Select **Configuration** from the Control Panel.
2. Select **Users**. The Users window appears.
3. Click on the **Passport One Rules** tab. The Passport One Rules page appears.

To assign users to Passport One profiles:

1. Select a user from the display portion of the main window.
2. Choose a profile from the **Profile** drop-down list.
3. Type the source address and the Passport One session duration in the **Source Address** and **Duration (seconds)** fields.
4. (Optional) You can assign additional profiles to the user by repeating steps 2 and 3.
5. Click on **Save**.

See also Users Window, "Users - Passport One Rules Page" on page II-166

How to Create Custom Banners for Telnet Authentication

When a user connects to Passport One via Telnet, a custom usage message can be displayed prior to log in. After a successful log in, a custom “terms and conditions” message can be displayed.

To create a custom banner before the login prompt

1. In the **/etc/security/firewall/clas/** directory, create a file named **custom-usemsg**. The file should have the following attributes: owner is **root**; group is **sys**; level is **SYS_PUBLIC**; owner has **read/write** (rw) permission.
2. Edit this file and type in the ACSII text that will appear prior to the log in prompt for Telnet authentication.

To create a custom banner after a successful connection

1. In the **/etc/security/firewall/clas/** directory, create a file named **custom-terms**. The file should have the following attributes: owner is **root**; group is **sys**; level is **SYS_PUBLIC**; owner has **read/write** (rw) permission.
2. Edit this file and type in the ASCII text that will appear upon successful Telnet authentication. This text will be displayed instead of the normal “Connected ...” message.

Passport One - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

To configure Passport One:

1. Ensure that the default ports for Passport One are defined in the **/etc/inet/services** file.
2. Define user rules and general Passport One configuration in the **/etc/security/firewall/clasd/clasd.conf** file.
3. Define packet-filtering rules templates in *profile* files.
4. Revise the HTML authentication forms (**login.html**, **challenge.html**, **accept.html**, and **deny.html**) as appropriate.
5. Permit connection to the authenticating login ports by adding rules similar to the following to the **/etc/security/firewall/ng_inet/netguard.conf** file:

```
permit  clas-telnet/tcp  EVERYONE  FIREWALL
permit  clas-http/tcp    EVERYONE  FIREWALL
permit  clas-https/tcp   EVERYONE  FIREWALL
```

6. Enable Passport One in the **/etc/security/firewall/startup.conf** file by editing the **CLASD=** and **CLASD_OPTS=** keywords:

```
CLASD=true
CLASD_OPTS=options
```

7. If using NT Domain Authentication, permit connections by adding rules similar to the following to the **/etc/security/firewall/ng_inet/netguard.conf** file:

```
proxy   139/tcp       Clients    PDCs
permit  139/tcp       PDCs       Clients    Enable_Reply
permit  137-138/udp   Clients    PDCs       Enable_Reply
permit  137-138/udp   PDCs       Clients    Enable_Reply
```

8. If using NT Domain Authentication, enable the feature in the **/etc/security/firewall/startup.conf** file by editing the **NTAD=** and **NTAD_OPTS=** keywords:

```
NTAD=true
NTAD_OPTS=options
```

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Configuration File (netguard.conf)" on page II-43
- "How to Enable a Standalone Proxy (startup.conf)" on page III-11

Passport One Configuration File (clasd.conf)

Use the **/etc/security/firewall/clas/clasd.conf** file to set up Passport One and the user definition database.

Format guidelines:

- Each statement is on a separate line
- Blank lines can be used
- Comments begin with the # character and continue until the end of the line

Statements:

include *configuration_files*
(Optional, one or more) Parses other configuration files. Use brackets < > around a file located in the default Passport One directory; otherwise, use a full path name. A maximum of 20 files can be included. This statement is case sensitive.

Interface *IP_address*
(Required, one or more) Interface on which Passport One is enabled.

MaxSession *number*
(Optional, one) Maximum number of simultaneous user-authenticated sessions. The default is 64.

RefreshPeriod *seconds*
(Optional, one) Frequency in seconds that the **clasd** daemon refreshes packet-filtering rules. The default is 5 seconds.

Client *user profile IP_address max_duration*
Defines user parameters for connections. Multiple records for each user are valid; the server uses the first rule that matches the user name and IP address. In authentication detection mode, the user doing the NT Authentication will be matched against the appropriate client rule. If there is not a user match and the user DEFAULT is defined, then the DEFAULT client rule will be matched. If there is no DEFAULT client rule, then this user will not get any extra privileges from matching this rule.

user
User ID this rule applies to.

profile
Profile file name that contains packet-filtering rules for the user's access attributes.

IP_address

Source IP address from which the user can make connections to Passport One. The wild card characters * and ? are accepted.

max_duration
Session timeout in seconds. Zero indicates no time limit.

File *file_name profile IP_address timeout*
Used for resource authentication detection mode. The file name successfully accessed within the share will be matched against file name in the appropriate client rule. If there is not a file name match, then this NT Client will not get any extra privileges from matching this rule.

file_name
Name of the file in the share name to which this rule applies. This name must be unique.

profile
Profile file name that contains packet-filtering rules for the user's access attributes.

IP_address
Source IP address from which the user can make connections to NTAD. This rule is not matched if the packet source IP address does not match this field.

max_duration
Session timeout in seconds. Zero indicates no time limit.

HTTPS-Port *port*
Port on which to listen for SSL connection attempts. The default is 3443.

ClientCAs *CA_tag(s)*
Enables client certificate authentication. The keyword ClientCAs is followed by one or more CA certificate tags, and each tag specifies the name of a file in the **/etc/security/firewall/vpn/ca_certs/**directory with the **.cer** extension removed. Each file in the **/etc/security/firewall/vpn/ca_certs/**directory must contain a DER/PEM encoded CA certificate. This information is used to generate the CertificateRequest message to be sent to the client. Multiple CA certificate tags are permitted, and at least one must be specified.

CertProfile *profile_name*
Profile used to generate packet-filtering rules for all sessions that authenticate with client certificates. Only one certificate profile can be specified. This profile is located in the **/etc/security/firewall/profiles/local/** directory. This keyword is required when the ClientCAs keyword is present.

SSLKeypair *keypair_tag*
Specifies the keypair to use for SSL/HTTPS. This keyword requires one keypair tag which is the name of a file in the **/etc/security/firewall/vpn/keypairs/** directory with the **.cer** or **.pvk** extension removed.

Note: The Client Certificate Authentication feature of Passport One is intended to be used only by sites that control their own Certification Authority. See the Caution statement in "SSL and Passport One" on page II-188.

The following example shows the layout of the **clasd.conf** file.

```
# /etc/security/firewall/clas/clasd.conf
include      <clasd.common.conf>
Interface    192.168.2.30
Interface    192.168.2.31
MaxSession   240
RefreshPeriod  4
#
Client  ericp   normal  192.9.200.*  0
Client  susanj  normal  *            120
```

Figure II-73. Passport One Configuration File Example

If you change a Client or CertProfile rule or the RefreshPeriod after clasd is running:

1. Determine the process ID (PID) of the Passport One daemon:

   `ps -ef | grep clasd`

2. Send a hangup signal to **clasd**:

   `kill -HUP` *PID*

Note: This procedure will not break current connections.

If you change an Interface or MaxSession value, or if the ClientCAs is added, deleted, or changed after clasd is running:

1. Determine the process ID (PID) of the Passport One daemon:

   `ps -ef | grep clasd`

2. Stop the Passport One daemon:

   `kill -SIGTERM` *PID*

3. Restart the Passport One daemon:

   `/usr/sbin/firewall/clasd` *options*

Note: This procedure will break current connections.

If you change a rule that affects the NT Authentication Detection daemon after ntadd is running:

1. Determine the process ID (PID) of the NT Authentication Detection daemon:

   ```
   ps -ef | grep ntadd
   ```

2. Send a hangup signal to the daemon:

   kill -HUP *PID*

Note: This procedure will not break current connections.

Passport One Profile Files

A profile file is a template for packet-filtering rules that correspond to a user's access attributes. Many profile files can exist, and several users can share a profile file. The **clasd** daemon constructs packet-filtering rules from the file and inserts the rules into its local **netguard.clas.conf** file for Passport One and its local **netguard.ntad.conf** file for NTAD.

Profile files do not have extensions and by default are located in one of the following two directories:

- **/etc/security/firewall/clas/profiles/common/**
- **/etc/security/firewall/clas/profiles/local/**

The **common** directory is updated by the Central Management feature, and the **local** directory is updated by the local system.

Profile files consist of packet-filtering rules and the following keywords:

%USER Inserts the source IP address of the system from which the user made the authenticating connection. To insert the source IP address and the source port of the system from which the user made the authenticating connection, see the **-S** option in the "Passport One Command (clasd)" on page II-206.

include Includes other profile files.

The following example shows the layout of a profile file.

```
# /etc/security/firewall/profile/devprofile
include  jimd_profile
permit   80/tcp  %USER         ALL_EXTERNAL
permit   21/tcp  ALL_INTERNAL  ALL_EXTERNAL   ENABLE_REPLY
proxy    23/tcp  ALL_INTERNAL  %USER
```

Figure II-74. Passport One Profile File Example

Passport One Command (clasd)

Start the Passport One daemon by running the **clasd** command on the command line or adding the options to the **/etc/security/startup.conf** file.

Syntax:

/usr/sbin/firewall/clasd [**-h** *http_port*] [**-t** *telnet_port*] [**-s** *https_port*] [**-S**] [**-d** *working_dir*]

Options and arguments:

-h *http_port* — Alternate port on which to listen for HTTP connections. The default is port 3080. A value of 0 disables the port.

-t *telnet_port* — Alternate port on which to listen for telnet connections. The default is port 3023. A value of 0 disables the port.

-s *https_port* — Alternate port on which to listen for HTTPS connections. The default is port 3443. A value of 0 disables the port.

-S — Changes the functionality of the %USER keyword in the profile file. Without the **-S** option, %USER inserts the source IP address of the system from which the user made the authenticating connection. With the **-S** option, %USER inserts the source IP address and the source port of the system from which the user made the authenticating connection.

-d *working_dir* — Alternate directory for Passport One files.

Note: To run the Passport One daemon standalone from the command line, you must invoke the command at NETWORK level. If you are not running at NETWORK level, precede the command with the **newlvl(1M)** command as follows:

/usr/sbin/newlvl NETWORK /usr/sbin/firewall/clasd *options*

Monitor and Control Active Connections Command (daemon)

The **daemon** command can be used to monitor and control the Passport One process. This command must be run by root at NETWORK level on the firewall running the Passport One process.

Syntax:

```
daemon -p clasd list
daemon -p clasd count
daemon -p clasd kill n
```

Options and arguments:

list Displays a list of all connections. Each connection in the list is displayed with four fields:

- Socket connection
- IP address of the connection
- Login used for the connection
- Time until the connection will timeout, displayed as *hh*:*mm*:*ss*

count Displays a count of the connections.

kill *n* Kills the connection with socket connection *n*. This number is determined from the output of the **list** command.

NT Authentication Detection Command (ntadd)

The ntadd command is used for NT Authentication Detection and NT Resource Authentication Detection. Start the standalone daemon by running the **ntadd** command on the command line or adding the options to the **/etc/security/startup.conf** file.

Syntax:

/usr/sbin/firewall/ntadd [**-A**] [**-S** *sharename*]

Options and arguments:

-A	Authentication option. When invoked with only the **-A** option, the daemon will perform only NT authentication detection.
-S *sharename*	Share option. When invoked with only the **-S** option, the daemon will perform only NT resource usage detection. The *sharename* argument specifies the name of a share that NTADD is to monitor for file access.
-A and **-S**	When invoked with both the **-A** and **-S** options, the daemon will perform both authentication detection and resource usage detection.
no option specified	When no options are specified, the daemon will perform only authentication detection.

Note: To run the NT Authentication Detection daemon standalone from the command line, you must invoke the command at NETWORK level. If you are not running at NETWORK level, precede the command with the **newlvl(1M)** command as follows:

/usr/sbin/newlvl NETWORK /usr/sbin/firewall/ntadd *options*

NT Authentication Detection Command Status (ntaddstat)

This command displays the status of the current connections for the NT Authentication Detection daemon. If a connection has been authenticated, the profile included in the packet-filtering rules is displayed as well.

Syntax:

`/usr/sbin/firewall/ntaddstat` [**`-n`**]

Options and arguments:

`-n` This option causes IP addresses and port numbers to be displayed. The default for the command is to convert IP addresses and port numbers into host and service names.

Note: To run the NT Authentication Detection Command Status daemon standalone from the command line, you must invoke the command at NETWORK level. If you are not running at NETWORK level, precede the command with the **newlvl(1M)** command as follows:

`/usr/sbin/newlvl NETWORK /usr/sbin/firewall/ntaddstat` *options*

Certificate Signing Request Command (mkcsr)

The **mkcsr** command is used to create a Privacy Enhanced Mail (PEM) encoded Certificate Signing Request (CSR). A CSR consists of a Distinguished Name (DN) and a public cryptographic key. The public cryptographic key is signed with the corresponding private cryptographic key. Only RSA key pairs are used by **mkcsr**.

The **mkcsr** program prompts for the elements of a DN. Your Certification Authority will have recommendations and requirements for each of the following elements:

- Country name
- State or province name
- Locality name
- Organization name
- Organizational unit name
- Common name
- E-mail address

mkcsr reads the elements it will use for constructing the DN from **/etc/security/firewall/keys/cert.conf**. This file can be edited to specify the prompts and provide defaults for the elements. See the **cert.conf(4)** manual page for complete information.

Each time **mkcsr** is run, it creates a new key pair (unless the **-k** option is used). Private keys are stored in the **/etc/security/firewall/keys/** directory in files named **privkey***nn***.pem**, where *nn* is a serial number. The most recently generated key is pointed to by the symbolic link **/etc/security/firewall/keys/privkey.pem**.

The Certificate Signing Request is placed in the **/etc/security/firewall/keys/csr.pem** file. The **csr.pem** file can be forwarded to a Certification Authority (CA) who converts the information into a digital certificate and returns it to the user. The CA determines the method by which the CSR is communicated to the CA, the methods by which the CA determines the authenticity of the information in the CSR, and the means of communicating the digital certificate to the user.

Syntax:

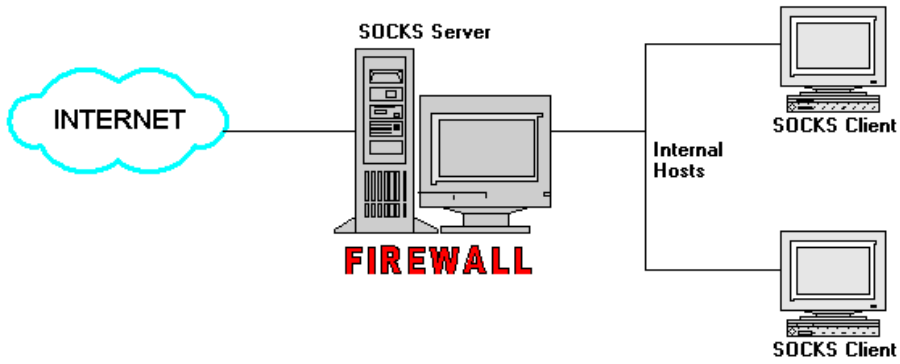
/usr/sbin/firewall/mkcsr [**-h**] [**-k** *keyfile*]

Options and arguments:

-h	Displays command syntax information.
-k *keyfile*	Uses the key pair located in the *keyfile* file instead of generating a new key pair.

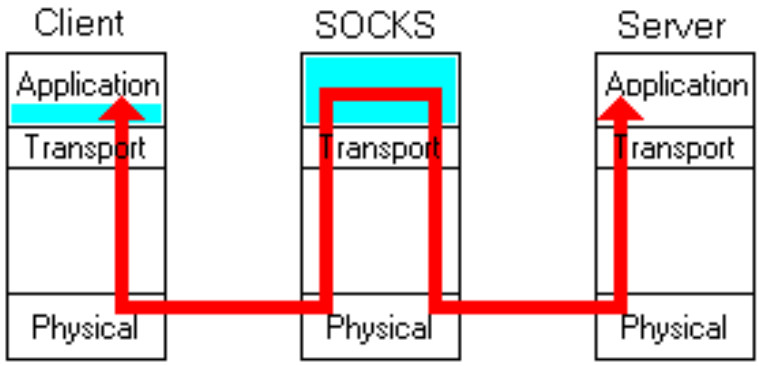
Chapter 10
SOCKS

SOCKS is a protocol that allows client programs that use the sockets API to send TCP and UDP traffic across a firewall. SOCKS uses sockets to represent and track individual connections, and SOCKS hides the IP addresses of client applications. SOCKS clients are specially modified programs that are able to connect to the SOCKS server. A SOCKS server processes connection requests from clients and either permits or rejects these requests based on the requesting user or the requested destination. SOCKS is most commonly used as a proxy server so that hosts in a LAN can pass traffic through a firewall and go out to the Internet.



SOCKS has two components, the SOCKS server and the SOCKS client. The SOCKS server is implemented at the application layer; the SOCKS client is implemented between the application and transport layers. SOCKS enables hosts on one side of a SOCKS server to access hosts on the other side of a SOCKS server without direct communication between the two hosts.

When an application client needs to connect to an application server, the client connects to a SOCKS proxy server. The SOCKS proxy server connects to the application server on behalf of the client and relays data between the client and the server. The SOCKS proxy server is the client of the application server.



The SOCKS Protocol Version 5 performs the following functions:

- Makes connection requests
- Authenticates users
- Sets up proxy circuits
- Relays application data

The SOCKS Protocol Version 5 is also known as authenticated firewall traversal (AFT) and is discussed in RFC 1928. The CyberGuard Firewall implements Dante, a version of the SOCKS client and server software developed by Inferno Nettverk A/S. Dante is distributed under the BSD license.

Note: The SOCKS server currently does not support GSSAPI. User names and passwords are passed between the client and the SOCKS server without encryption. GSSAPI, Generic Security Service Application Program Interface, provides security services to calling applications. It allows a communicating application to authenticate the user associated with another application, to delegate rights to another application, and to apply security services such as confidentiality and integrity on a per-message basis. GSSAPI is discussed in RFC 1508 and RFC 1509.

SOCKS Window

Use this window to enable SOCKS, identify the internal and external interfaces of the SOCKS daemon, and define the rules governing communications between SOCKS clients and the SOCKS daemon. Information about SOCKS appears on two notebook pages: Setup and Rules.

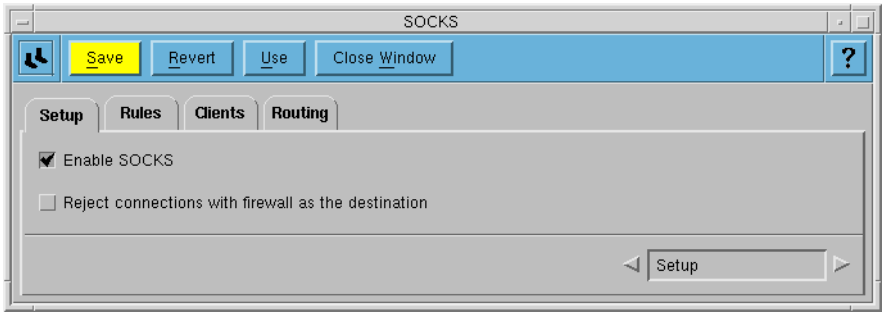


Figure II-75. SOCKS Window - Setup Page

The following windows also are related to SOCKS:

Packet-Filtering Rules	Configure packet-filtering rules for SOCKS
Alerts and Activities	(Activities page) Enable logging of SOCKS activities
Activity Reports	Monitor SOCKS activities

See also:

- “Window Components” on page I-10
- “Activity Reports Window” on page I-252
- “Packet-Filtering Rules Window” on page II-22
- “Activities Page” on page II-341
- “How to Configure SOCKS” on page II-217

SOCKS Setup Page

Use this page of the SOCKS window to enable SOCKS, define the internal and external networks that use SOCKS, and to set timeout variables.

This page contains the following fields and controls:

Enable SOCKS Starts the SOCKS daemon.

External Interfaces List of the firewall's external interfaces through which the SOCKS daemon sends outgoing traffic. At least one external interface check box must be checked.

Internal Interfaces List of the firewall's internal interfaces through which the SOCKS daemon listens for incoming connections from SOCKS clients. At least one internal interface check box must be checked.

Port Number(s) (Optional) Port numbers on which the SOCKS daemon listens for incoming connections from SOCKS clients. Each internal interface check box has a port number text field that affects a comma-separated list of port numbers. The default SOCKS port number of 1080 is assumed if the port number text field is left blank.

Connection Timeout (seconds)
(Optional) Specifies the length of time in seconds that a SOCKS client has to send a request after a successful connection. The default value is 0, which indicates that no timeout is imposed.

I/O Timeout (seconds)
(Optional) Specifies the length of time in seconds that an established connection can remain idle. The default value is 0, which indicates that no timeout is imposed.

See also:

- "Console Messages Window" on page I-245
- "Packet-Filtering Rules Window" on page II-22

SOCKS Rules Page

Use this page of the SOCKS window to define the rules for permitting or denying a specified SOCKS service request based on the requesting and destination IP addresses, the type of service or destination port number, and the requesting users.

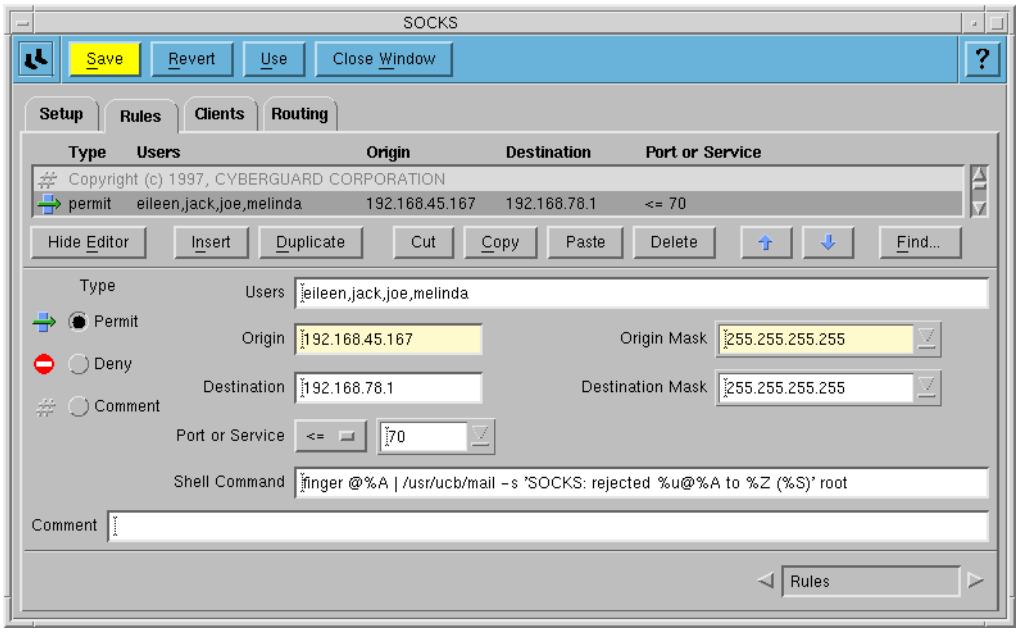


Figure II-76. SOCKS Window - Rules Page

This page contains the following fields and controls:

Update Packet-Filter Rules

Automatically generates packet-filtering rules to allowed the specified traffic. The rules permit both SOCKS and the requested services. The following example shows the rules that permit through the firewall only SOCKSified Telnet and FTP clients that are internal to the firewall:

```
# SOCKS rules
# (added automatically by the CyberGuard GUI)
permit  socks/tcp   ALL_INTERNAL FIREWALL
# Rules for the selected client services of SOCKS
permit  telnet/tcp  FIREWALL     EVERYONE
permit  ftp/tcp     FIREWALL     EVERYONE
#End of SOCKS rules
```

Type

Has the following settings:

Permit

Allows service requests that match this rule.

Deny

Rejects service requests that match this rule; requests not matching any rule are denied.

Comment
Treats this line as a comment; permits typing a comment in the **Comment** field.

Origin — Network IP address, including the lenth of the network prefix, of a requesting host. 0.0.0.0/0 will match any IP address. Individual IP addresses require a **/32**.

Destination — Network IP address, including the length of the network prefix, of a destination host. 0.0.0.0/0 will match any IP address. Individual IP addresses require a **/32**.

Port or Service — Relational operator and a destination port number (0-65535), port number range, or service name from the **/etc/inet/services** file. The relational operator specifies the condition of the port number or port number range. Values include: **<**(less than), **<=** (less than or equal to), **=** (equal to), **!=** (not equal to), **>=** (greater than or equal to), **>** (greater than), and the word **Any** (match any port number). If the operator is **Any**, the text input field is not enabled, and the rule applies to all destination port numbers or services. A port number range can be entered in the form of: *start_port*-*end_port*/**tcp** or *start_port*-*end_port*/**udp**.

Users — Login IDs of users requesting the SOCKS service. Each user name should be separated by a comma. If this field is blank, the line applies to any login ID. The maximum length of this field is 400 characters.

Comment — Text or a disabled rule. This field may be blank.

Note: The order of SOCKS rules is significant. When a service request arrives, the software scans the rule list from top to bottom looking for a rule match, applies the *first* rule that matches the characteristics of the requesting client, and ignores subsequent rules. If no rule matches, the request is denied.

How to Configure SOCKS

You can use the SOCKS window set up SOCKS services and define the rules for permitting or denying a specified SOCKS service request.

The order of SOCKS rules is significant. When a service request arrives, the software scans the rule list from top to bottom looking for a rule match, applies the *first* rule that matches the characteristics of the requesting client, and ignores subsequent rules. If no rule matches, the request is denied.

To display the Setup page of the SOCKS window:

1. Select **Configuration** from the Control Panel.
2. Select **SOCKS**. The Setup page of the SOCKS window appears.

To setup the SOCKS configuration:

1. Check the **Enable SOCKS** box.
2. Check at least one **External Interface** through which the SOCKS daemon sends outgoing traffic.
3. Check at least one **Internal Interface** through which the SOCKS daemon listens for incomming connections from SOCKS clients.
4. (Optional) Add one or more port numbers in the **Port Number(s)** field.
5. (Optional) Type a timeout value in seconds in the **Connection Timeout (seconds)** field.
6. (Optional) Type a timeout value in seconds in the **I/O Timeout (seconds**) field.
7. Click on **Save**. Your changes take effect at the next system reboot.
8. (Optional) Click on **Use**. Your changes take effect immediately.

To setup SOCKS rules:

1. Click on the Rules tab. The Rules page appears.
2. (Optional) Select the rule that you want the new rule to follow. (Skip this step if you want to add a new rule at the top of the list.)
3. Click on **Insert**. An incomplete new line appears in the list. The **Type** field is set to **Permit**.
4. Select **Permit** or **Deny** in the **Type** field.
5. Type an IP address (including the length of the network prefix) in the **Origin** field.
6. Type an IP address in the **Destination** field.

7. (Optional) Select a relational operator to indicate a range of ports.
8. (Optional) Select the service to apply the rule to. The selected entry appears in the **Port or Service** field. You also can type in the service name with or without a protocol. A port number or a port number range (0-65535) is also accepted, but in this case, the protocol (tcp or udp) is required. For example:

   ```
   http
   http/tcp
   23/tcp
   23-80/tcp
   ```

9. (Optional) Type a comma-separated list of login IDs in the **Users** field.
10. Click on **Save**. Your changes take effect at the next system reboot. If the **Update Packet-Filter Rules** box is checked, updated packet-filtering rules automatically appear in the Packet-Filtering Rules window.
11. (Optional) Click on **Use**. Your changes take effect immediately.

To change a SOCKS rule:

1. Select the rule that you want to change.
2. Edit the fields that you want to change.
3. Click on **Save**. Your changes take effect at the next system reboot. If the **Update Packet-Filter Rules** box is checked, updated packet-filtering rules automatically appear in the Packet-Filtering Rules window.
4. (Optional) Click on **Use**. Your changes take effect immediately.

To delete a SOCKS rule:

1. Select the rule that you want to delete.
2. Click on **Delete**. The rule is deleted. Packet-filtering rules are automatically removed from the Packet-Filtering Rules window.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. (Optional) Click on **Use**. Your changes take effect immediately.

See also “Packet-Filtering Rules Window” on page II-22.

SOCKS - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

To configure the SOCKS server:

1. Use the **/etc/security/cyber/trace.conf** file if you want to log SOCKS activity in a file for auditing purposes.
2. Define the SOCKS service in the **/etc/inet/services** file:

   ```
   socks   1080/tcp
   ```

3. Define packet-filtering rules in the **/etc/security/firewall/ng_inet/netguard.conf** file. You must permit both SOCKS and the requested service. The following example shows how to permit through the firewall only SOCKSified Telnet and FTP clients that are internal to the firewall:

   ```
   permit  socks/tcp   ALL_INTERNAL  FIREWALL
   permit  telnet/tcp  FIREWALL      EVERYONE
   permit  ftp/tcp     FIREWALL      EVERYONE
   ```

4. Define the SOCKS configuration and rules in the **/etc/security/firewall/proxies/sock5d.conf** file.
5. Enable SOCKS for standalone operation through the **/etc/security/firewall/startup.conf** file:

   ```
   SOCKS5=true
   SOCKS_OPTS5=options
   ```

See also:

- "Network Services File (services)" on page II-40
- "Packet-Filtering Rules Configuration File (netguard.conf)" on page II-43
- "Activities Configuration File (trace.conf)" on page II-366
- "How to Enable a Standalone Proxy (startup.conf)" on page III-11

SOCKS Configuration File (sock5d.conf)

Use the **/etc/security/firewall/proxies/sock5d.conf** Dante server configuration file to control access to the SOCKS proxy server and its services. You can define the rules governing communications between SOCKS clients and the SOCKS proxy server based on the requesting host, the destination host, the type of service, and the requesting user.

The configuration file for the Dante server controls both access and logging. It is divided into two parts, server settings and rules. The server settings control the generic behavior of the server, such as internal and external IP addresses and the connection timeout. Two sets of rules work at different levels: client-rules and socks-rules.

Client-rules are checked first and are used to see if the client is allowed to connect to the Dante server. These rules work at the TCP/IP level. Socks-rules are a level higher and are checked after the client connection has been accepted by the client-rules. The socks-rules are used to evaluate the socks request that the client sends. They thus work at the socks protocol level.

The order of SOCKS rules is significant. When a service request arrives, the rules are scanned from top to bottom looking for a match. The first rule that matches is applied and subsequent rules are ignored. Requests that do not match any rule are denied.

For complete details about the **sock5d.conf** file, see the **sock5d.conf(4)** man page. For information about the Dante server, see **http://www.inet.no/dante**.

SOCKS Command (sock5d)

Use the **/usr/sbin/firewall/sock5d** command to run the Dante network SOCKS server daemon.

Syntax:

/usr/sbin/firewall/sock5d [**-DLhVdnv**] [**-N** *copies*] [**-f** *config_file*]

Options and arguments:

-D The **sock5d** daemon will detach from the controlling terminal and run in the background as a system daemon.

-L Displays the **sock5d** license.

-N *copies* The **sock5d** daemon will fork off copies of itself when starting. This option can be used for very busy servers.

-V Verifies the configuration file and exits.

-d Enables debugging.

-f *config_file* The **sock5d** daemon will read its configuration from *config_file*.

-h Shows the currently valid options.

-n Disables TCP keep-alive messages. Normally **sock5d** enables TCP keep-alive messages so that connections from machines that have crashed or for other reasons no longer can be reached will time out.

-v Displays the **sock5d** version.

Chapter 11
Intrusion Detection IDS

NetProwler provides dynamic network intrusion detection that transparently examines network traffic. It identifies, logs, and terminates unauthorized use, misuse and abuse of computer systems by internal and external hackers. The NetProwler IDS consists of the following components: the NetProwler Console, the NetProwler Manager, and one or more NetProwler Agents. The NetProwler Console is used to configure and monitor the NetProwler Agent(s) through the NetProwler Manager. Each of these components can run on separate systems or they can all be on the same system. The NetProwler Agent monitors the network traffic looking for suspicious events.

The NetProwler Agent can be configured to send a packet containing the offending source, destination, and protocol to the firewall when a suspicious event occurs. For security, the Agent computes an HMAC-MD5 message digest and appends this to the packet for authenticity. The authentication string used for creating the message digest is configurable through the Console.

The CyberGuard Firewall can be configured to work with NetProwler to stop offending connections. The NetProwler Agent can be configured to send a notification packet with information about the offending session to the CyberGuard Firewall so that the firewall can shutdown network paths as needed. As a security measure, the firewall can be configured to accept packets from a specific address. Upon receipt of a packet that authenticates using the message digest, the firewall will audit the information and can deny traffic based on the information in the packet if configured to do so. The alert subsystem can be configured to send an alert based on the audit event.

Intrusion Detection Window

Use this window to enable and configure Intrusion Detection.

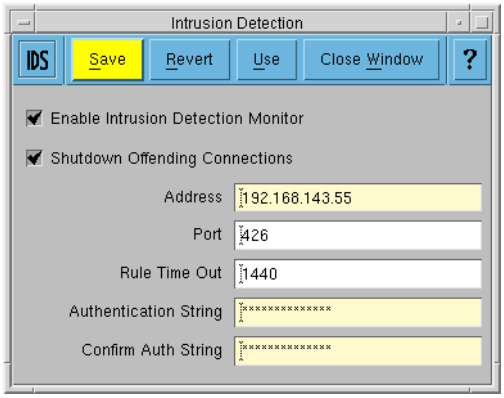


Figure II-77. Intrusion Detection Window

This window contains the following fields and controls:

Enable Intrusion Detection Monitor
Enables the Intrusion Detection system on the firewall to monitor packets on the configured port.

Shutdown Offending Connections
Upon receipt of a valid packet (a packet from a valid address that authenticates), the Intrusion Detection system will always audit the packet. When this box is checked, IDS will add a packet-filtering rule that will disallow further traffic from the source address to the destination address given in the packet. This disallowed traffic will be based on the ports and protocol specified in the packet.

Address
Host name or IP address of the NetProwler agent. If an address is specified in this field, only packets from the specified address are accepted. If **any** is specified, packets from any address are accepted as long as they authenticate.

Port
The NetProwler port for accepting packets from the network. The default port is 426.

Rule Time Out
Time in minutes that the packet-filtering rule, added when Shutdown Offending Connection is checked, is valid. The default is 1440 minutes (24 hours).

Authentication String	String used to compute the HMAC-MD5 digest used for authenticating packets from the Agent. The packet and this string are used to compute a digest that must match the digest sent with the packet in order for the packet to be valid. Thus, the Agent and the firewall must be configured with the same authentication string.
Confirm Auth String	Authentication string retyped for confirmation.

How to Configure Intrusion Detection

You can use the Intrusion Detection window to configure the prowler to listen for packets describing suspicious events from NetProwler IDS and to shut down offending connections.

To display the expanded Intrusion Detection window:

1. Select **Configuration** from the Control Panel.
2. Select **Intrusion Detection**. The Intrusion Detection window appears.

To add a host to your network:

1. Check **Enable Intrusion Detection Monitor**.
2. Check **Shutdown Offending Connections** to add a packet-filtering rule to disallow further traffic from the source address to the destination address described in the packet.
3. Type the host name or IP address of the NetProwler Agent in the **Address** field.
4. Type the port number for accepting information from the NetProwler in the **Port** field.
5. If **Shutdown Offending Connections** is checked, type a time in minutes for the packet-filtering rule to remain active in the **Rule Time Out** field.
6. Type the authentication string used to compute the HMAC-MD5 digest used for authenticating packets in the **Authentication String** field, and then confirm this string in the **Confirm Auth String** field.
7. Click on **Save**.

Intrusion Detection - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

Intrusion Detection File (prowler.conf)

The **/etc/security/firewall/prowler.conf** file is

Format guidelines:

- Each host must be listed on a separate line
- Fields are separated by white space (tabs or spaces)
- Comments begin with the # character and continue until the end of the line

Statements:

Enable yes|no
(Required) Enables the Intrusion Detection system on the firewall to monitor packets on the configured port.

Shutdown yes|no
(Optional) Upon receipt of a valid packet (a packet from a valid address that authenticates), the Intrusion Detection system will always audit the packet. When this box is checked, IDS will add a packet-filtering rule that will disallow further traffic from the source address to the destination address given in the packet. This disallowed traffic will be based on the ports and protocol specified in the packet.

Addr *host_name*|*IP_address*|**any**
(Required) Host name or IP address of the NetProwler agent. If a host name or address is specified, only packets from the specified address are accepted. If **any** is specified, packets from any address are accepted as long as they authenticate.

Port *port_number*
(Optional) The NetProwler port for accepting packets from the network. The default port is 426. If this keyword is not present, the default port number is used.

RuleTO *minutes*
(Optional) Time in minutes that the packet-filtering rule, added when **Shutdown yes** is present, is valid. The default is 1440 minutes (24 hours). If this keyword is not present, the default time is used.

AuthString *authentication_string*
(Required) String used to compute the HMAC-MD5 digest used for authenticating packets from the Agent. The packet and this string are used to compute a digest that must match the digest sent with the packet in order for the packet to be valid. Thus, the Agent and the firewall must be configured with the same authentication string.

The following example shows a typical **prowler.conf** file.

```
# /etc/security/firewall/prowler.conf
Enable     yes
Shutdown   yes
Addr       1.23.456.7
AuthString
```

Figure II-78. Intrusion Detection File Example

Chapter 12
Security Options

A number of security options can be configured on the firewall. These security options include the handling of dynamic packet-filtering rules, user password requirements, and user blacklisting. These security options play an important role in customizing and securing your firewall.

Security Options Window

Use this window to configure various security options for the CyberGuard Firewall. The Security Options window has three notebook pages: Dynamic Rules, Password Options, and User Blacklisting.

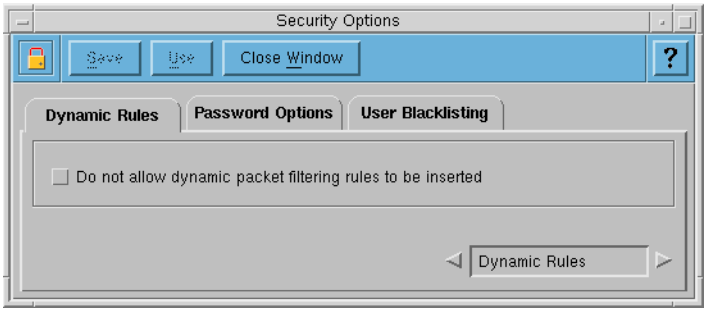


Figure II-79. Security Options Window - Dynamic Rules Page

Security Options - Dynamic Rules Page

Use this page of the Security Options window to prohibit dynamic packet-filtering rules from being automatically inserted by the firewall.

This page contains the following fields and controls:

Do not allow dynamic packet-filtering rules to be inserted
During the course of firewall operation, dynamic packet filtering-rules are sometimes added. Check this box to prohibit dynamic packet-filtering rules from being added. automatically. If this option is checked, the user must add the appropriate rules for the firewall to function.

See also “Packet-Filtering Rules” on page II-21.

Security Options - Password Options Page

Use this page of the Security Options window to specify requirements for user passwords.

Figure II-80. Security Options Window - Password Options Page

This page contains the following fields and controls.

Enter length of password history
Number of days the system will remember the previous password. This prevents users from reusing passwords. This value can be set between 0 (off) and 50.

Enter minimum password length
Specifies the minimum number of characters that must be present in a valid password. The default is 6. Valid values are 1 through 8.

Require passwords to be a combination of mixed case, numbers, and punctuation
Requires passwords to contain a combination of three (3) of four (4) of the following:

- An uppercase letter
- A lowercase letter
- A number
- Some form of punctuation

Checking this setting ensures more secure passwords.

See also:

- "CyberGuard Firewall Login Window" on page I-47
- "Password Page" on page II-160

Security Options - User Blacklisting Page

Use this page of the Security Options window to enable user blacklisting, specify how users are removed from the blacklist, and list users who are not to be blacklisted. This page applies to firewall users, such as FSO and FSM users, and not to proxy users. For example, a user attempting to login from the console as cgadmin would be subject to blacklisting.

User blacklisting works in conjunction with the Failed Logins alert on the Alerts page of the Alerts, Activities, and Archives window. (See "Alerts Page" on page II-328 and "Suspicious Event Types" on page II-331.) You must enable the Failed Logins alert to enable user blacklisting on the firewall.

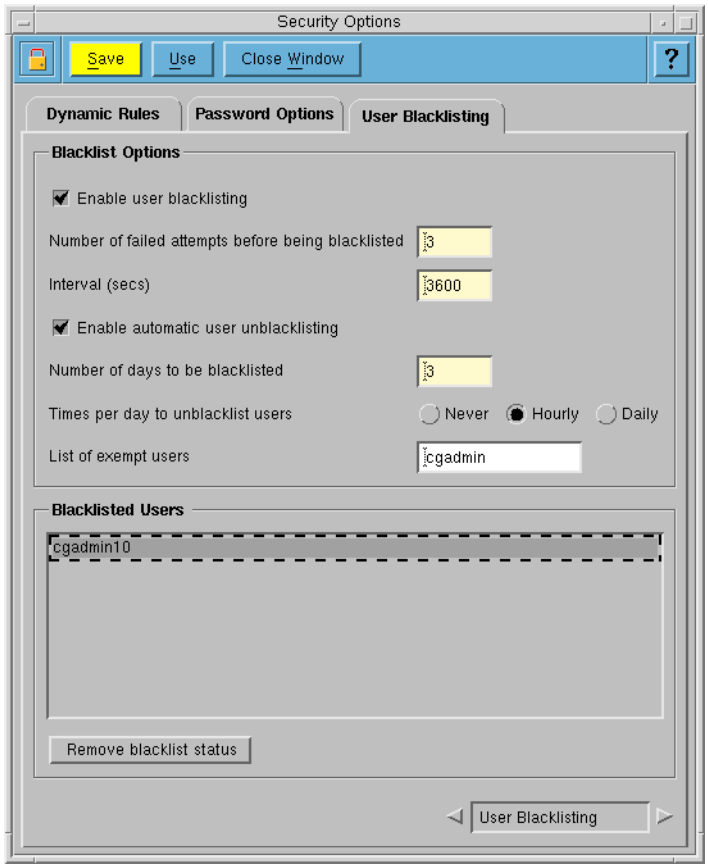


Figure II-81. Security Options Window - User Blacklisting Page

This page contains the following fields and controls.

Enable user blacklisting
Enables the blacklisting feature.

Number of failed attempts before being blacklisted
Specifies the number of times a user can fail to authenticate in the time specified in the **Interval** field before the user ID is disabled.

Interval (secs)
Specifies the time period during which a user can fail to authentication the number of times specified in the **Number of failed attempts before being blacklisted** field before the user ID is disabled.

For example, assume the **Number of failed attempts before being blacklisted** field is **3** and the **Interval (secs)** field is **20**. If a user fails to authentication three time within 20 seconds, the user is blacklisted. However, if a user fails to authenticate twice in 19 seconds, and fails to authenticate again 3 seconds later, the alert will not triggered, and the user will not be blacklisted.

Enable automatic user unblacklisting
Specifies that blacklisted users will automatically unblacklisted after the number of days specified in the **Number of days to be blacklisted** field.

Number of days to be blacklisted
Specifies the number of days a blacklisted user will be unable to login to the firewall.

Times per day to unblacklist users
Specifies how often to remove users from the blacklist so they can login to the firewall. The options are **Never**, **Hourly**, and **Daily**

List of exempt users
Users, such as system administrators, who should not be blacklisted under any circumstances.

Blacklisted Users
List of users who have been blacklisted.

Remove blacklist status
When a user in the **Blacklisted Users** box is selected this button is enabled. When the button is pressed, the user is removed from the list. However, the user is not reenabled until **Use** is clicked.

Chapter 13
Virtual Private Network (VPN)

A Virtual Private Network (VPN) securely connects distant networks and nodes to form a single, protected network. The data is protected as it tunnels through unsecured networks, such as the Internet or intranets. The VPN ensures data origin authentication, data integrity, data confidentiality, and anti-replay protection.

The CyberGuard VPN is a gateway between trusted and non-trusted networks. It is a security gateway, protecting network access (netguard), network visibility (NAT), and network data (VPN). The two types of VPN connections that are supported by the CyberGuard VPN are *gateway-to-gateway* and *VPN host-to-gateway.*

In Figure II-82, the gateway-to-gateway tunnel connects networks A and B to form a Virtual Private Network (VPN). The gateway-to-gateway connection is how the distant and disparate networks of enterprise branch offices are brought together to form the VPN. The host-to-gateway tunnel allows the remote user to connect to the VPN from anywhere Internet access is available. The VPN host type connection is useful for enterprise telecommuters, a company's mobile sales force, and extranet partner access to protected business-related services provided by the enterprise.

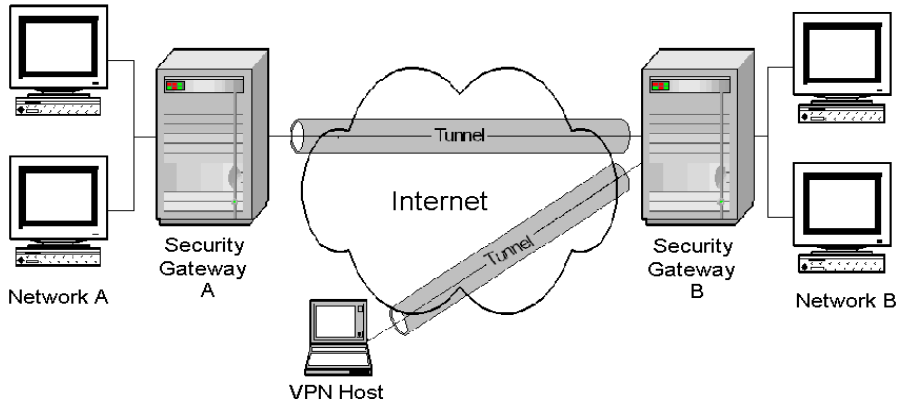


Figure II-82. VPN Connections

IP Security (IPSec)

The CyberGuard VPN is based on IP Security (IPSec). IPSec secures the data at the network level. It defines a security protocol for both IPv4 and IPv6, which automatically protects upper layer protocols (TCP, UDP, etc.).

The endpoints of tunnels are referred to as the IPSec peers. The security attributes shared between the CyberGuard VPN and the peer are referred to as the VPN *secure channel*. Typically, it is the remote endpoint relative to the CyberGuard VPN being managed that is referred to as the IPSec peer, or simply “the peer”.

The IPSec protocol suite consists of traffic security protocols and cryptographic key management procedures and protocols that are used together to provide security at the network level. The IPSec protocol suite consists of the following:

- Authentication Header (AH) protocol
- Encapsulating Security Payload (ESP) protocol
- Internet Key Exchange (IKE)

The Authentication Header (AH) protocol is used when only integrity and origin protection are needed. It guarantees that the packet is not modified in transit, and that it was actually sent by the party that is claimed to be the sender. However, it does not provide confidentiality for the traffic.

The Encapsulating Security Payload (ESP) protocol, like AH, specifies that a header is included in a data packet and provides packet data encryption. ESP does not protect the IP header.

The communicating parties must agree on the protocol, the parameters to be used, and the cryptographic keys to be used with the security protocols. This information is negotiated using either the Internet Key Exchange (IKE) or manually to create a Security Association (SA)

A security association is a set of security parameters that specifies the protocols, their parameters, and the cryptographic keys used between two hosts. An SA is created when hosts communicate for the first time, and remains active until it expires or the limit on the amount of traffic is reached. It is the purpose of the key management protocol to negotiate and create security associations between hosts.

A security association is identified by a Security Parameters Index (SPI) value, together with the address of the destination host. An SPI is an arbitrary 32-bit number that is assigned to a security association when the security association is created. The AH and ESP protocol headers always include the SPI number. This value is used to obtain the security association (e.g. encryption and authentication keys) that will be used to verify or decrypt the packet.

The basic components of the CyberGuard VPN IPSec implementation are illustrated in Figure II-83.

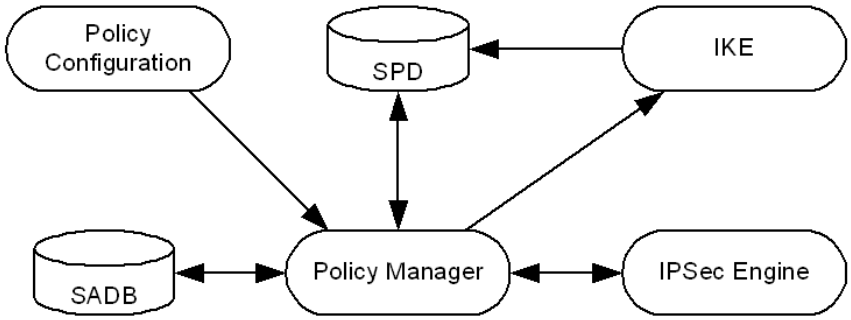


Figure II-83. IPSec Implementation

The IPSec engine runs in the kernel. It interfaces with the Security Policy Database (SPD) and the Security Association Database (SADB) through the Policy Manager (PM).

The SPD defines the security policy to be enforced for both inbound and outbound packets. The SADB contains all active Security Associations (SAs). The *Security Association* defines the security processing that is performed on IPSec traffic traveling in a particular direction, inbound or outbound.

The Internet Key Exchange (IKE) component negotiates the SAs for a connection. IKE is activated for inbound requests from a VPN peer and by the IPSec Policy Manager for outbound traffic that needs an SA to communicate with its peer.

The Policy Manager runs at both the user and the kernel level and manages the data in the SPD and SADB. The IPSec engine interfaces with the Policy Manager to retrieve the appropriate SA. IKE interfaces with the Policy Manager to negotiate with peer IKE daemons, and to relay the outcome of IKE negotiations. A policy configuration component interfaces with the Policy Manager to update configuration information.

IKE and Manual Keying

When defining a secure channel for a peer, the firewall administrator may choose to establish keys using IKE, which is the default mechanism, or Manual Keying.

Internet Key Exchange (IKE)

IKE is the default method used to establish authentication keys. IKE parameters can be customized on a per-channel basis. Two types of parameters that can be customized: *authentication data* and *IKE data*.

Authentication Data

Authentication data governs the mechanism used between the CyberGuard VPN and a peer to authenticate the identity of each other. Two methods of authentication are available: *preshared secret* and *certificates*. These two methods are not mutually exclusive. If both methods are configured, the CyberGuard VPN will first attempt to authenticate using certificates, since this is considered the more sophisticated method. If authentication via certificates is unsuccessful, the firewall will try to authenticate using the preshared secret.

Preshared Secret

The Firewall Administrator must manually agree and securely communicate a secret phrase with the administrator of the peer, because the same preshared secret must be configured on the peer system. Although using a preshared secret is easy to configure, the burden of securely sharing this secret becomes prohibitive as the number of peers increases. Using certificates for authentication is more manageable.

Certificates

A certificate is a publicly known, electronic document that binds a user's identity with his digital signature. A certificate is issued by a Certification Authority (CA). There are many CAs that issue certificates.

For more information on certificates, see "Certificates and the CyberGuard Firewall" on page II-241.

IKE Data

IKE Data consists of parameters used for IKE negotiations with the peer. These include IKE Protection Strategy, IKE Mode, and a Diffie-Hellman group number used to provide Perfect Forward Secrecy.

The IKE Protection Strategy consists of a name and a list of parameter groupings. Each grouping defines all of the parameters needed for IKE. The list represents a priority-ordered set of IKE parameters; the first grouping in the list has highest priority. The firewall is preloaded with three IKE sample protection strategies. During the IKE process, the IKE Protection Strategy is negotiated between the CyberGuard VPN and its peer. For the negotiation to be successful, one of the groupings listed in the IKE Protection Strategy will be agreed upon as the IKE parameters to be used. The successful negotiation of an IKE Protection Strategy results in an IKE SA (Security Association) between the CyberGuard VPN and the peer.

For more information, refer to the following sections:

- "VPN Secure Channels - IKE Advanced Settings Dialog Box" on page II-267
- "IKE Protection Strategies Window" on page II-256

Packet-Filtering Rules for IKE

IKE is an application-layer protocol that connects and accepts connections on port **500/udp**. The firewall automatically configures **500/udp** traffic between the firewall and its IPSec peers. Instead of hard-coding port 500 in these automatically configured packet-filtering rules, the service name is used.

Packet-filtering rules for IKE are automatically inserted as needed to permit IKE traffic to the peer. The rules will not appear in any netguard configuration file. The **netguard -ln** command may be used to verify the existence of the static IKE rules:

```
permit  ike/udp   FIREWALL    IPSec_Peer
permit  ike/udp   IPSec_Peer  FIREWALL
```

The IKE service port is found in the **/etc/services** file, and the service port name is to be used to resolve the actual port number. Because the IKE service port is hard-coded in many IPSec implementations, changing its value may result in interoperability problems.

For more information, see "Network Services File (services)" on page II-40.

Manual Keying

If the firewall administrator chooses to use manual keying, IPSec peer authentication is not done because IKE is not performed.

Manual keys must be defined for network traffic inbound to the CyberGuard VPN and for network traffic outbound from the CyberGuard VPN. The values for the inbound manual keys defined on the CyberGuard VPN must be used as the outbound manual keys on the peer, and the values for the Outbound Manual Keys defined on the CyberGuard VPN must be used as the inbound manual keys on the peer.

The SAs established using Manual Keying never expire; they remain valid until they are deleted. This may be a security risk because the longer a key is used, the more exposure it has thereby increasing the possibility that the key could be compromised.

Manual keying requires the firewall administrator to manually agree on the set of keys to be used with the peer. Manual keys are difficult to share securely, and manual keying does not scale well when dealing with multiple peers. It is strongly recommended that manual keying be used only to interact with vendors who lack proper IKE support.

See also:

- "VPN Secure Channels - Channel Information Page" on page II-265
- "VPN Secure Channels - Manual Key Configuration Dialog Box" on page II-271

VPN Client Configuration

When a remote host connects to the firewall using a VPN client, it may be desirable for the host appear to be present on an internal network. The VPN Client Configurations window specifies the appropriate network configuration for the VPN client to operate on the private side of the firewall. These network attributes can include an IP address, netmask, the DNS server, and the WINS server. The firewall/VPN gateway dynamically assigns these private network attributes to the VPN client.

VPN Client Configuration is useful for host-type secure channels, used to accept IKE connections from anonymous peer IP addresses. Peer-protected networks defined for the channel should match the address range specified in the VPN Client Configuration. Packet-filtering rules are written to permit one or more of the addresses, supplied by the VPN Client Configuration, to some point internal to the firewall/VPN gateway.

To enable this feature, the GUI is first used to create the VPN Client Configuration. The VPN Client Configuration names are then referenced by the VPN Secure Channel via IKE Advanced Settings. Finally, an IPSec packet-filtering rule references the secure channel (via manual or auto-selection), and the packet filter (netguard) reads the configuration data and uses it to configure the VPN policy manager (vpnguard).

To enable the SafeNet SoftRemote® client, the **Virtual Adapter** should be set to **Required** under **My Identity** of the Connection; and the SoftRemote client should NOT be configured to Allow to Specify Internal Network Address (under Options/Global Policy Settings); The IKE-mode-config exchange is initiated by vpnguard when the SoftRemote client starts its Phase-2 (IPSec) negotiation. The IKE Exchange Logging feature in the VPN Controls window can be used to track the progress of the CFG mode exchange.

Note: When the SoftRemote client initiates the FIRST phase-2 (Quick Mode) negotiation, it has not yet been given the IKECFG-assigned address to use; therefore, it connects using its physical address as the phase-2 identity. The exchange should fail (no proposal chosen) because no connection block contains the client's physical address. This behavior is normal.

Extended Authentication (XAUTH)

The VPN system can authenticate clients; Extended Authentication is a means by which the user behind the client is authenticated. At the start of the connection sequence, the user at the remote VPN client must authenticate (via an XAUTH IKE exchange) with the VPN policy Manager (vpnguard) before the client is allowed to establish VPN tunnels. The user name and password are validated via firewall authentication rules. Using XAUTH and VPN Client Configuration, the same client is able to use the same IP address for each connection.

XAUTH is enabled in the VPN Secure Channel/IKE Advanced Settings window with the **Use Extended Authentication (XAUTH)** setting. The XAUTH exchange is initiated by vpnguard when the SoftRemote starts its phase-2 (IKE Quick Mode, or QM) negotiation. XAUTH occurs before IKECFG. The IKE Exchange Logging feature in the VPN Controls window can be used to track the progress of the CFG mode exchange.

An authentication dialog box pops up on the client to allow the entry of a user name and password. The user has about 30 seconds to respond. For XAUTH, there are no changes to how the SoftRemote client is configured.

Note: The Authentication Method selection on SoftRemote offers **Pre-Shared Key; Extended Authentication** as a method. This does not work with the CyberGuard VPN gateway. Select only **Pre-Shared Key**.

Another setting on the VPN Secure Channel/IKE Advanced Settings window, **Enforce XAUTH and Configuration exchange**, when disabled, allows the mixing of XAUTH and IKECFG (ISAKMP Configuration Method: draft-dukes-ike-mode-cfg-02) with non-XAUTH/IKECFG clients on the same Host-type Secure Channel. VPN clients that are not recognized as supporting XAUTH and IKECFG are allowed to connect without participating in the ISAKMP (IKE) Configuration Method exchanges. Recognized VPN clients are still required to participate in XAUTH or IKECFG, if configured in the Secure Channel.

Certificates and the CyberGuard Firewall

A certificate is a publicly known, electronic document that binds a user's identity with his digital signature. A certificate is issued by a Certification Authority (CA). A Certification Authority is an entity that performs the following functions:

- Issues certificates for users and/or subordinate CAs (sub-CAs)
- Revokes certificates and issues Certificate Revocation Lists (CRLs)
- Publishes certificates to public servers so that users can retrieve them
- Archives valid and revoked certificates

There are many CAs that issue certificates.

Definitions

PKCS12 Password-protected file format used for storing and transporting multiple private keys and certificates.

PKCS7 File format used for sending encrypted and/or digitally-signed messages. Files ending in **.p7c** are commonly used to store CA certificate chains which are comprised of one or more CA certificates including the root CA certificate. Files ending in **.p7m** or **.p7r** are commonly used by CAs to store certification request reply messages.

PKCS10 File format used for certificate requests. These are also known as certificate signing requests or CSRs. These files are frequently encoded in PEM (Base 64) format so that they can be sent through email and displayed in HTML forms. Note that the terms "PKCS 10 request", "certificate signing request", "CSR" are used interchangeably with "certificate request" in the documentation.

X.509 Authentication framework or model that uses public key cryptography for strong authentication. It is the foundation for public key infrastructure. Certificates conforming to the X.509 format are usually encoded according to Distinguished Encoding Rules (DER) or Privacy Enhanced Mail (PEM).

Importing a Certificate on the Firewall

If the firewall administrator chooses to authenticate the peer using certificates, the firewall must offer its own certificate as part of the authentication process. The firewall administrator can import certificates that have been issued by various CAs to identify the firewall. To import a certificate on the firewall, the firewall administrator must take the following steps:

1. Obtain certificates that identify the firewall from various CAs. To create a certificate request, see "Certificate Request Wizard" on page II-290.
2. Place the files containing the certificates on the file system of the firewall.
3. Import these certificates into the VPN configuration system. See "Firewall Keypair Import Wizard" on page II-293 and "CA Certificate Import Wizard" on page II-298.

During the authentication process, the CyberGuard VPN and the peer will exchange certificates as a method of identifying themselves. After obtaining the peer's certificate, the firewall will scrutinize the certificate's validity and examine if the CA that issued the peer's certificate is trusted by the firewall. The firewall administrator designates which CAs are trusted.

The CyberGuard VPN will then accept a certificate from any user whose certificate was issued by a Trusted CA unless the firewall administrator restricts the users.

Certificate Revocation List

A Certificate Revocation List (CRL) is a list of revoked certificates that is issued periodically by a CA. CRLs can be stored as disk files, or they can be accessed online through various servers, most commonly through LDAP, HTTP, or FTP. CRLs contain time stamps that indicate the start of their validity period and the expected date of the issuance of the next CRL.

A CRL Distribution Point (CDP) consists of information that tells users where and how to retrieve CRLs issued by a specific CA. CDPs are embedded in X.509 version 3 certificates.

Certificates and CRLs are stored in repositories to make them accessible to users. LDAP servers, Web servers, and FTP servers are examples of repositories.

Online Certificate Status Protocol (OCSP) is defined in RFC 2560. Agents called OCSP responders collect CRLs from repositories and/or CAs and use the collected information to answer users' queries about the validity of certificates. This helps users by eliminating the time needed to download large CRLs.

Certificate Revocation Checking by the CyberGuard Firewall/VPN

The CyberGuard Firewall can be configured to use CRLs and OCSP to check the validity of VPN certificates.

The CyberGuard Firewall/VPN is able to:

- Retrieve CRLs from CRL distribution points on LDAP, HTTP or FTP servers.
- Read CRLs from disk files.
- Retrieve CA certificates from LDAP servers.
- Send OCSP requests using the HTTP protocol to OCSP responders.

The relationship of the firewall to these different entities is illustrated in Figure II-84.

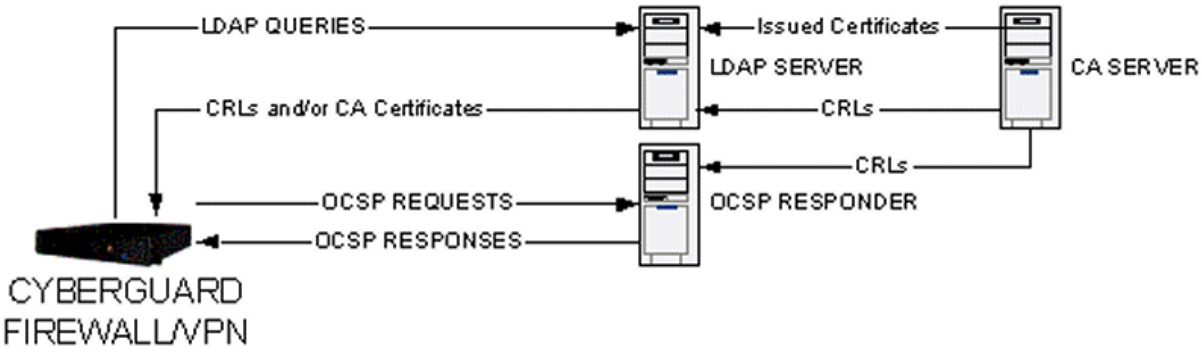


Figure II-84. CyberGuard Firewall/VPN and CA Certificates

IKE Certificate Services

The following sections describe the requirements for setting up IKE Certificate Services with the CyberGuard Firewall/VPN.

Several requirements must be considered for certificate revocation checking to be successful.

CA, LDAP, and OCSP Software Setup Considerations

Certificate revocation checking has been tested with the following certification authority products:

- Baltimore UniCERT version 3.5.3
- Microsoft Server 2000 Certification Authority

OCSP has been tested with the following validation authority products:

- Enterprise Validation Authority version 4.2.2
- Enterprise Validation Authority version 4.6.1

The following LDAP directories have been tested for CRL storage and retrieval:

- iPlanet Directory Server version 5.1
- OpenLDAP version 2.0.23

CRL Distribution Points with Baltimore UniCERT

Consider the following issues when configuring CRL Distribution Points with the Baltimore UniCERT Certification Authority:

1. The CRL Distribution Points should be configured during the initial setup of the CA.
2. Inspect the **IDP extension in CRLs/ARLs is critical** check box in the CA's Certificate, CRL, and Directory Options tab and make sure that it is **Disabled**. See "Configuring the Certificate, CRL, and Directory Options" in the *UniCERT v3.5.3 Administrator's Guide--Certification Authority*.
3. The Location Type of the CRL Distribution Point must be set to **X.500 Directory Name**. This is the only supported location type. Refer to the section "Setting up and using CDPs" in the *UniCERT v3.5.3 Administrator's Guide-Certification Authority*.
4. The LDAP directory entry for the CRL Distribution Point must have a distinguished name equal to the certification authority's distinguished name. Refer to the documentation for the LDAP directory server for information on how to check the LDAP directory.
5. The LDAP server must give the firewall anonymous read access to the directory and it must support LDAP version 2.
6. Follow the steps in "Appendix D: Publishing certificates using third-party products" of the *UniCERT v3.5.3 Administrator's Guide-Appendices*.

ValiCert Enterprise Validation Authority

Consider the following issues when setting up the ValiCert Enterprise Validation Authority for the first time:

1. Follow the procedure in the section "Setting Up the ValiCert Enterprise VA" on page 48 of the *ValiCert Enterprise VA Installation and Administration Guide* to create an OCSP responder key pair using the EVA.

2. Follow the procedure in the section “Issuing Delegated Certificates” on page 246 of the *ValiCert Enterprise VA Installation and Administration Guide* to create a Customer Registration Policy for the OCSP responder certificate.

3. Submit the certificate request to the UniCERT RAO. Contact the Registration Authority Operator user to find out how to do this at your installation.

4. When the OCSP responder certificate has been issued, follow the procedure in the section “Managing Certificate Stores” on page 112 of the *ValiCert Enterprise VA Installation and Administration Guide* to submit the OCSP responder certificate and the certificates of the CAs that publish CRLs to the EVA.

Microsoft 2000 Server Certification Authority

Consider the following issue when configuring CRL Distribution Points with the Microsoft Windows 2000 Server Certification Authority:

1. Only the HTTP URI and FTP URI CRL Distribution Points have been tested with the firewall.

2. Consult the Microsoft documentation and configure the Certification Authority on the Microsoft Windows 2000 Server. Ensure that the HTTP and FTP servers are serving the CRLs and CA certificates.

3. Remember to add packet-filtering rules to permit outgoing HTTP or FTP connections from the firewall to the Microsoft CA Server so that the firewall can retrieve CRLs and/or CA certificates.

See also:

- “IKE Certificate Services Window” on page II-277
- “Certificate Request Wizard” on page II-290
- “Certificate Management Window” on page II-292
- UniCERT v3.5.3 Documentation Set
- ValiCert Enterprise, VA Installation and Configuration Guide, Version 4.2.2
- IETF Request for Comments: 2560, Internet X.509 Public Key Infrastructure, OCSP
- IETF Request for Comments: 3280, Internet X.509 Public Key Infrastructure, Certificate and Certificate Revocation List (CRL) Profile

Integration with Other Firewall Components

Virtual Private Networking is fully integrated into the firewall and works with other firewall components to form a complete VPN solution.

VPN and Packet Filtering

The CyberGuard Firewall packet filter (netguard) works in conjunction with the CyberGuard VPN. It is responsible for reading the policy configuration and translating it into rules for both the firewall and the IPSec policy manager. An IPSec policy option is available in the packet-filtering rules window to enable security for the given rule and to provide the additional IPSec parameters required to enforce the policy.

By enabling IPSec for a packet-filtering rule, the user chooses to protect the packet flows between the IPSec peer and the CyberGuard VPN. The IPSec option describes the protection strategy for the packet data and explains how to establish a secure channel to the remote party. All of the parameters have satisfactory defaults and do not require user intervention to configure. The firewall comes preloaded with four sample IPSec protection strategies to assist users in creating the appropriate protections strategy.

To determine if a netguard session was tunneled:

- For a snapshot view, use the **netguard -ln** command to see which static rules and dynamic sessions have IPSEC information such as ipsec_src, ipsec_dst, and/or ipsec_nat associated with them.
- To track a session over a period of time, run the following command to cause an audit record to be generated when a new packet-filtering rule is created:

  ```
  auditset -S+ng_add_rule
  ```

  (The **auditset** command must be run prior to network traffic passing through the firewall in order to generate the audit records for **ng_add_rule**. This command can also be added to the **/etc/rc2.d/S03auditlogd** file.)

  The audit record can be seen using the following command:

  ```
  auditrpt -n ng_add_rule
  ```

  The audit record for **ng_add_rule** will contain one or more of the following:

  `src ipsec` - if IPSec is enabled to the source for this rule
  `dst ipsec` - if IPSec is enabled to the destination for this rule
  `nat` - if **Allow NAT to Translate Addresses** is checked for this rule

  If the verbose option of the **auditrpt** command is used as follows:

  ```
  auditrpt -V
  ```

the **ng_add_rule** audit information is as follows:

```
Enable IPSEC to src TRUE|FALSE
Enable IPSEC to dst TRUE|FALSE
NAT VPN traffic TRUE|FALSE
```

The audit record for the **ng_add_rule** events contains a rule ID that consists of the date, time, and a sequence number. This same rule ID is part of the audit record for the corresponding **ng_end_session** event. Knowing the rule ID, the **ng_add_rule** and **ng_end_session** pair can be identified. This also identifies the time range that this rule was active. Actual traffic passing through the firewall because of this rule is not explicitly marked with the rule ID.

To identify such traffic, look at corresponding traffic (**ng_permit**, **ng_deny**), match type of traffic (telnet, ftp, etc.) by the corresponding port number (as defined in the **/etc/services** file), match source and destination addresses. If this traffic matches a **ng_add_rule** audit record that indicates VPN was enabled, then this traffic was protected by VPN.

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Packet-Filtering Rules Basic Page" on page II-23
- "Packet-Filtering Rules IPSec Page" on page II-29

VPN and Network Address Translation (NAT)

The CyberGuard VPN is designed to work with Network Address Translation (NAT). When static or dynamic NAT is configured using the Network Address Translation window, the **Allow NAT to Translate Addresses** option on the IPSec page of the Packet-Filtering Rules window can be used to cause Network Address Translation (NAT) to translate addresses for an IPSec tunnel.

If the **Allow NAT to Translate Addresses** option is enabled, NAT will be applied to network traffic before it is sent through the tunnel (encapsulated) for outbound traffic, and after it exits the tunnel for inbound traffic.

The **Allow NAT to Translate Addresses** option is disabled by default. When disabled, the IP addresses of packets are assumed to be private, and no NAT is performed, even if NAT is enabled in the Network Address Translation window. When establishing a VPN between trusted CyberGuard VPN peers that both have dynamic NAT activated, it is necessary to tunnel through (circumvent) NAT and have the private addresses preserved. The CyberGuard VPN gateways on either side of the tunnel are able to route the private addresses emerging from the tunnel.

Figure II-85 illustrates the situation in which NAT is enabled and **Allow NAT to Translate Addresses** is not checked.

The goal is to establish a VPN consisting of `Net1` and `Net2`, which are behind `vgA`, and `Net3` and `Net4`, which are behind `vgB`. The network addresses are private and are not publicly routable; however, `vgA` and `vgB` belong to the same enterprise, and it is desirable to share the private network configuration.

Any host on any of these networks can initiate a connection with any other host on one of theses networks. The private address must not be translated by NAT entering the tunnel, or translated by NAT after exiting the tunnel. Based on its configuration, the firewall must determine when not to translate.

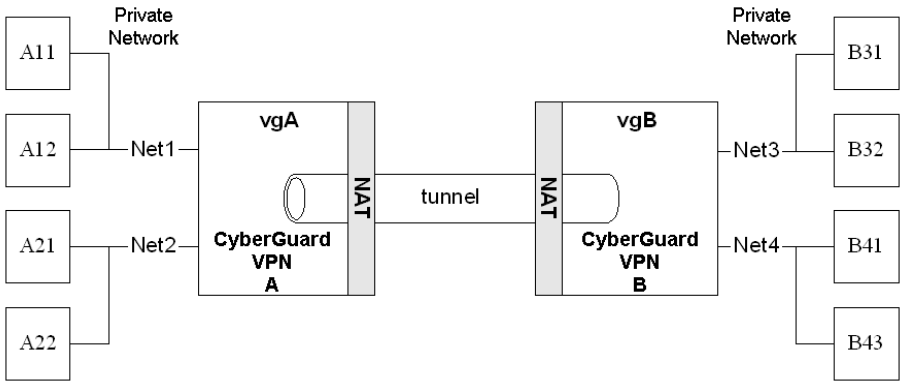


Figure II-85. NAT is Enabled but not Applied to VPN Tunnel

Figure II-86 illustrates the situation in which NAT is enabled and **Allow NAT to Translate Addresses** is checked. The VPN is connecting a private network to a public network. The initiator of the connection to be tunneled is a private address behind the firewall NAT, and the destination is a public server. The public server does not have knowledge of the private network. The private address must be translated by NAT before entering the tunnel at the firewall, and translated again by NAT after exiting the tunnel at the firewall. Static NAT must be used if NAT is applied and the initiator of the tunnel is on the public side.

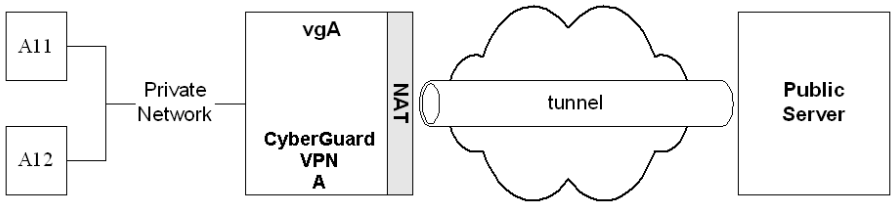


Figure II-86. NAT is Enabled and Applied to VPN Tunnel

See also:

- “Network Address Translation” on page II-63
- “Packet-Filtering Rules IPSec Page” on page II-29

VPN and NAT-Traversal (NAT-T)

Network Address Translation (NAT) typically involves changing addresses in the headers of Internet Protocol (IP) packets. In doing this, NAT devices can break the basic IPSec assumption that *packet addressing should not change on the network route between endpoints*.

NAT-Traversal circumvents the changes made by NAT and allows the free use of AH, ESP, and IPComp in tunnel and transport modes regardless of NAT use on the network route between IPSec endpoints.

For NAT-T to work properly, it must be able detect one or more NATs between IPSec hosts and then negotiate the use of UDP encapsulation of the IPSec packets through the NAT devices.

During IKE phase one (e.g., Main Mode), IPSec devices first determine if they both support NAT-T. Next, the devices determine whether or not NAT occurs anywhere on the communications path between them by sending NAT-D (NAT Discovery) packets. NAT-D packets send information about source and destination IP addresses and ports. If the IP address and ports are not the same, the VPN devices know that a NAT device exists somewhere in between.

During the IKE phase two (Quick Mode) exchange, if a NAT device was detected, the VPN policy manager negotiates use of UPD-encapsulated tunnel mode for the IPSec security association (SA).

Usually, NAT assignments last for a short period of time and are then released. For IPsec to work properly, the same NAT assignment needs to remain intact for the duration of the VPN tunnel. NAT-T accomplishes this by requiring any end point communicating through a NAT device to send a “keepalive” packet to prevent NAT end points from being remapped during the session.

All NAT Traversal communications begin over UDP port 500, which is already open for IKE (Internet Key Exchange) communications in IPsec VPNs. Once a NAT device is discovered, all subsequent IKE exchanges occur on UDP port 4500. Note that UDP port 4500 is also used for the NAT-T “keepalive” and UDP-encapsulated IPSec packets generated by the firewall as VPN gateway.

The NAT-T implementation supports the following Internet Drafts:

- draft-ietf-ipsec-nat-t-ike-03.txt
- draft-ietf-ipsec-udp-encaps-03.txt

Notes:

- NAT-Traversal should not be confused with NAT-Smart. These two features are not related. NAT-Traversal is used to setup a UDP-encapsulated tunnel between two IPSec peers when there is a NAT device *between* the peers. NAT-Smart dictates how the firewall NAT will handle translation of packets that will pass through an established IPSec tunnel.
- As with ESP tunnel packets arriving at and departing from the firewall VPN, the NAT-T udp-encapsulated and keepalive packets terminate at the IPSec

engine in the firewall network stack, and are not seen by the packet-filter (ip_netguard).

- The IKE Exchange Logging feature in the VPN Controls window can be used to track the progress of NAT-Traversal exchanges between VPN peers.
- NAT pools cannot be used in conjunction with VPN NAT-Smart. NAT-Smart is the ability to choose between bypassing the firewall's Network Address Translation (NAT) or allowing NAT to Translate the internal (local) address of an IPSec connection. If the IPSec packet-filtering rule is set to **Allow NAT to Translate Addresses**, the VPN policy must be written using the would-be translated address. Because IKE peers negotiate the policy (addresses) well before an actual connection is made, the translated address must be static (i.e., predictable). With NAT pools, the translated address cannot be predicted in advance. See "Network Address Translation" on page II-63 and "NAT Rules Page" on page II-67.

NAT Traversal is enabled on the IKE Advanced Settings Dialog Box. See "VPN Secure Channels - IKE Advanced Settings Dialog Box" on page II-267.

VPN and Passport One

Passport One provides the most secure way to give IPSec access to VPN hosts, especially if the IP address cannot be predicted, as in the case of a traveling employee. The remote user first authenticates with Passport One. The Passport One user profile contains packet-filtering rules for the user. The packet-filtering rules configured for the user have IPSec enabled for required VPN connections. Passport One substitutes the VPN host's IP address for the %USER address specification in Passport One packet-filtering rules.

See also:

- "Passport One Window" on page II-190
- "Passport One Rules Page" on page II-193

VPN and Alerts, Activities, and Reporting

Alerts

Four alerts are provided for VPN on the Alerts page of the Alerts, Activities, and Archives window:

- VPN IKE alert
- VPN IPSec alert
- VPN Interceptor alert
- VPN X9.17 random number failure
- VPN Certificate alert

Alert Summary reports are provided through the Alert Summary and Activity Reports windows.

Activities

Four activities are provided for VPN on the Activities page of the Alerts, Activities, and Archives window:

- VPN IKE activity
- VPN IPSec activity
- VPN Interceptor activity
- VPN Certificate activity

Activity reports are provided through the Activity Reports window.

Reports

Seven reports are provided for VPN on the System Information window:

- IKE Exchange Logging
- General IPSec/IKE SA Information
- Detailed IPSec SA Information
- Detailed IKE SA Information
- Global IPSec SA Information
- Virtual Network Routing (Sorted by Channel Name)
- Virtual Network Routing (Sorted by Peer GW Addr)
- Virtual Network Routing (Sorted by Network Address)

See also:

- “Alerts Page” on page II-328
- “Activities Page” on page II-341
- “Alert Summary Window” on page I-250
- “Activity Reports Window” on page I-252
- “System Information Window” on page I-246

VPN and SmartProxies

SmartProxy connections can be configured to work with the CyberGuard VPN. After a proxy requiring IPSec is enabled in the SmartProxies window, the firewall administrator must add the IPSec option to the proxy rule in the Packet-Filtering Rules window.

See also:

- “Packet-Filtering Rules Window” on page II-22
- “SmartProxy Connections” on page II-254
- “SmartProxies Window” on page III-5

VPN and High Availability

The CyberGuard VPN feature can be used in conjunction with the High Availability feature. When the standby system in an HA pair enters the serving state, it will force the peers to negotiate new IKE SAs when creating new sessions with the HA pair.

Special Connection Considerations

The following connection types require special treatment:

- Host-to-Gateway Connections
- Client-Initiated Sessions
- SmartProxy Connections
- FTP Data Connections

Host-to-Gateway Connections

VPN hosts are typically end-user (personal) computers equipped with IPSec-based VPN client software. The client software is invoked to establish a secure connection with the CyberGuard VPN. The CyberGuard VPN must be configured to allow secure connection initiated by the VPN client software. These connections are different from gateway-to-gateway connections because the physical IP address of the host is not always known in advance.

The IPSec peer configuration for VPN hosts defines the interface to which IKE negotiations by VPN clients are initiated. The IPSec peer definition for VPN hosts is a many-to-one relationship - many VPN hosts establish connections using a single CyberGuard VPN peer definition.

VPN hosts initiate the negotiation with the IKE service on the firewall. Once the host is authenticated by IKE, the IPSec parameters are negotiated (Phase 2), and a secure tunnel to the firewall is established.

Client software for VPN hosts often has the capability of configuring a virtual IP address to use once the IKE SA is established. The virtual IP address is assigned to the VPN host user. This enables remote users to appear as internal users on a private network. When a virtual address is used, the source address of traffic originating from the VPN host is different from its physical address. The virtual IP address is analogous to the protected networks of a VPN gateway peer. Virtual address configuration on the VPN client provides the capability of predicting the remote address to use when configuring the firewall. If the virtual network of VPN hosts is known, it can be configured similar to a gateway and specific packet-filtering rules can be written.

Using Passport One is perhaps the most secure way to provide IPSec access to VPN hosts, especially if the IP address cannot be predicted. The remote user first authenticates with

Passport One. The Passport One user profile contains packet-filtering rules for the user. The packet-filtering rules configured for the user have IPSec enabled for required VPN connections. Passport One substitutes the VPN host's IP address for the %USER address specification in Passport One packet-filtering rules and writes the rule to **netguard.clas.conf**. Passport One then runs the **netguard(1M)** command.

Notes:

- Virtual addresses (addresses located on the remote end of a VPN tunnel) do not need to be routable; however, packet filter parsing generates warning messages for nonroutable addresses that it encounters. To avoid these warning messages, it is strongly recommended that you configure a default route.
- Only one host-type secure channel may be defined per network interface. Because the initiating remote gateway's address is assumed to be unknown (for example, a remote or traveling employee or a VPN client), the host-type channel connection will match any valid VPN peer during IKE Phase 1 negotiation. This match is made if no other channel configurations match and the VPN peer is connecting on the configured interface. Because a host channel matches any connection, only one secure channel is allowed.

Client-Initiated Sessions

Firewall packet-filtering rules are designed to control network traffic originating at a specified network location and destined for a service port of a destination network location. A packet-filtering rule defines a client-to-server relationship. Permitted network connections are only allowed if they originate at the client and are destined for the server. To allow connections to be initiated in the opposite direction, a second rule is required. For example, the firewall security policy for the figure below states that host A1 is permitted connection to the Telnet service of host B1, and vise versa.

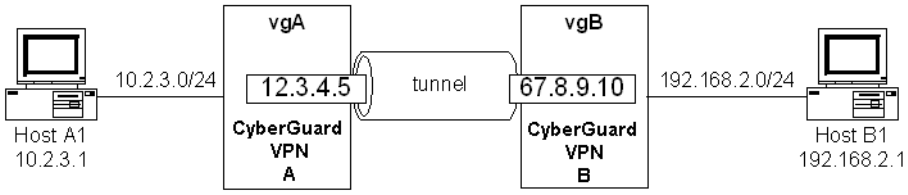


Figure II-87. VPN Client/Server Configuration

The following packet-filtering rules are written on both firewalls to allow Telnet clients on B1 to connect to the A1 server and to allow Telnet clients on A1 to connect to the B1 server:

```
permit  telnet/tcp   A1   B1   ipsec=default
permit  telnet/tcp   B1   A1   ipsec=default
```

SmartProxy Connections

Configuring VPN connections for SmartProxies is not automatic. After a proxy requiring IPSec is configured and enabled in the SmartProxies window, the firewall administrator must add the IPSec option to the proxy rule in the Packet-Filtering Rules window.

Note: Support for tunnels on the server-side of proxy rules is automatic.

Inbound To Firewall

Tunneling proxy connections that are specified as **Inbound To Firewall** on the Smart-Proxies window is a common scenario. The following two examples refer to Figure II-88 in which `vgA` is the firewall being configured. The Telnet client, `B1`, arrives at `vgA` through the tunnel with `vgB`. The proxy server-side connection is made with `A1` through a direct tunnel to `A1`.

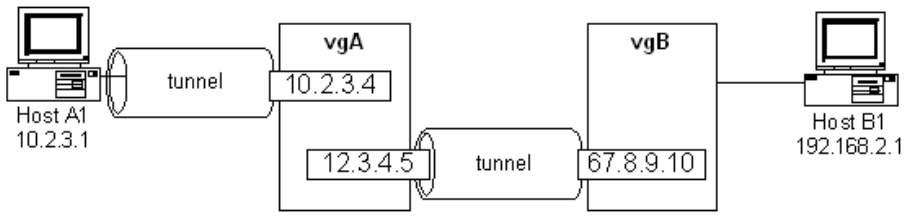


Figure II-88. Two-Tunnel Proxy Connection

Packet-Filtering Rules when Pass Address is Enabled

When Pass Address is enabled on the Dynamic page of the Network Address Translation window, a proxy rule and a permit rule are necessary. In this case, because we have to write an extra rule to permit the server-side connection, it may be explicitly protected by IPSec policy without producing any undesirable side effect.

Rules similar to the following should be added on the Packet-Filtering Rules window.

```
proxy   telnet/tcp  192.168.2.1  vgA       ipsec=default
permit  telnet/tcp  vgA          10.2.3.1  ipsec=default
```

Packet-Filtering Rules when Pass Address is Disabled

When Pass Address is disabled, two proxy rules are written. Both the client and server-side connections may be tunneled. Because the initial connection is with the firewall, the second of the two rules only matches server-side traffic on the interface to the server.

Rules similar to the following should be added on the Packet-Filtering Rules window.

```
proxy  telnet/tcp  192.168.2.1  Firewall  ipsec=default
proxy  telnet/tcp  192.168.2.1  10.2.3.1  ipsec=default
```

Outbound Through Firewall

When tunneling proxy connections that are specified as **Outbound Through Firewall** on the SmartProxies window, two packet-filtering rules must be configured instead of one:

```
proxy   proxy   external   internal  ipsec=options
permit  proxy   firewall   external  ipsec=options
```

See also:

- “NAT Interfaces Page” on page II-69
- “Packet-Filtering Rules Window” on page II-22
- “SmartProxies Window” on page III-5
- “Pass Address and Packet-Filtering Rules” on page III-15

FTP Data Connections

The FTP application protocol presents special circumstances to the firewall and NAT devices for the following reasons:

- The FTP protocol uses one connection for the command/control session between client and server (port 21/tcp, normally) and another connection for data transfers.
- The port and IP address used in the data connection is passed between the client and server inside the FTP control session payload. This exchange occurs with the PORT command issued by the client or the server 227-reply to the client's PASV command.

The firewall packet filter and NAT know about FTP command payload. The firewall automatically sets up the appropriate data connection rule from the information it reads from the FTP control payload.

To secure the FTP data connection, the port number must be omitted on the underlying IPSec policy configuration. This implies that writing an FTP rule using the IPSec option creates a VPN policy that performs the configured IPSec transform for all connections from the specified addresses (i.e., for any TCP port number). Care must be taken in the placement of these rules as they will match (during IKE negotiation) more than the FTP traffic for which they are intended. The firewall packet filter still enforces the actual FTP data connection.

IKE Protection Strategies Window

An IKE Protection Strategy represents the settings that are negotiated by the CyberGuard VPN with an IPSec peer during IKE Phase 1. Use the IKE Protection Strategies window to define one or more groups of cryptographic properties as an IKE protection strategy. The list represents a priority-ordered set of IKE parameters. The first grouping in the list has highest priority. During the negotiation process, the IKE Protection Strategy is negotiated between the CyberGuard VPN and its peer. For the negotiation to be successful, one of the groupings will be agreed upon and its parameters will be used. The successful negotiation of an IKE Protection Strategy results in an IKE SA (Security Association) between the CyberGuard VPN and the peer. IKE Protection Strategies that are configured in this window can be selected on the IKE Advanced Setting dialog box.

Three sample IKE Protection Strategies are preloaded on the CyberGuard VPN so that users will be able to create tunnels immediately:

Default Propose all - stronger security first

HighSecurity Limit choices to the more secure algorithms

Aggressive IKE aggressive mode: only one DH group may be specified

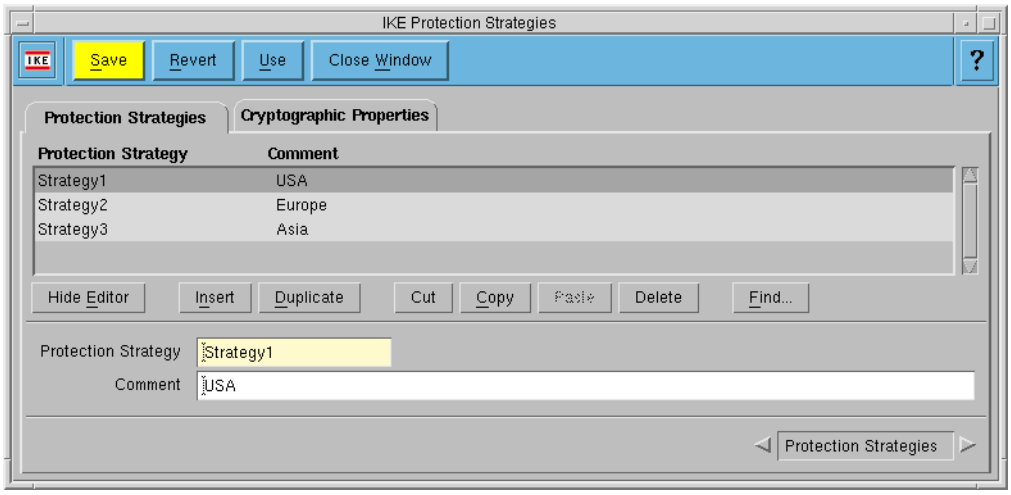


Figure II-89. IKE Protection Strategies Window - Protection Strategies Page

IKE Protection Strategies - Protection Strategies Page

Use this page of the IKE Protection Strategies window to create protection strategy names to which to add cryptographic properties.

This page has the following fields:

Protection Strategy — User-defined name for an IKE protection strategy. The list represents a priority-ordered set of IKE parameters. The first grouping in the list has highest priority.

Comment — Describes the purpose of the IKE protection strategy.

IKE Protection Strategies - Cryptographic Properties Page

Use this page of the IKE Protection Strategies window to add cryptographic properties to an IKE protection strategy.

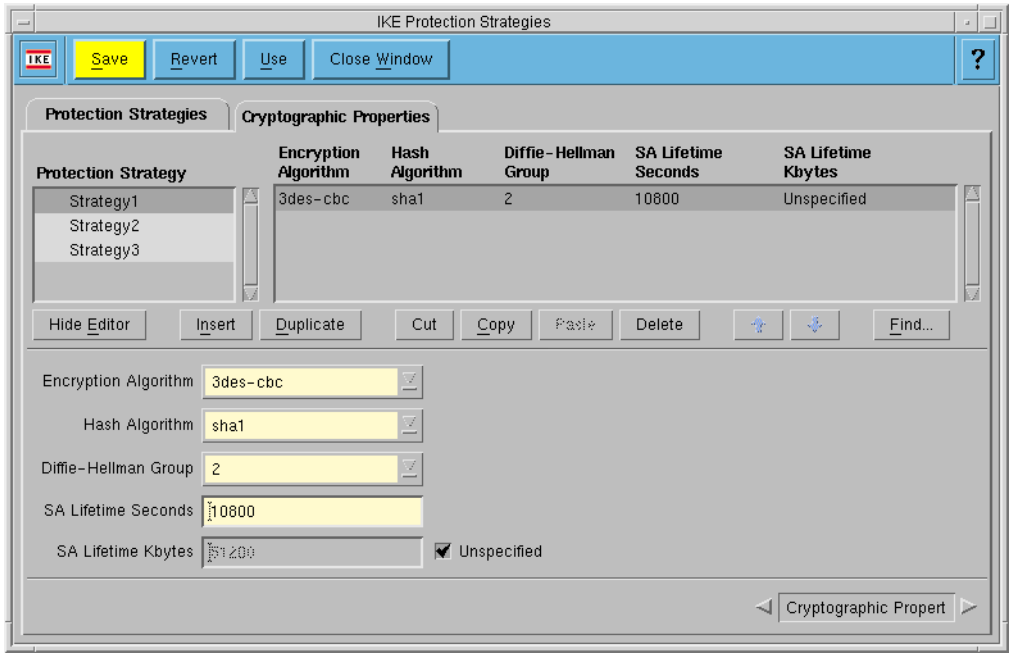


Figure II-90. IKE Protection Strategies Window - Cryptographic Properties Page

This page has the following fields and controls:

Protection Strategy — Displays a list of Protection Strategies defined on the Protection Strategies page. Select a Protection Strategy to configure its cryptographic properties.

Encryption Algorithm	Displays a list of encryption algorithms. Supported algorithms are: **3des-cbc**, **des-cbc**, **aes-cbc**, **twofish-cbc**, **blowfish-cbc**, **cast128-cbc**. The default value is **3des-cbc**.
Hash Algorithm	Displays a list of hash algorithms. Supported algorithms are: **sha1**, **md5**, **tiger192**, and **ripemd160**. The default value is **sha1**.
Diffie-Hellman Group	Displays Diffie-Hellman group numbers **1**, **2**, and **5**. The default value is **2**.
SA Lifetime Seconds	Duration of the SA in seconds. The minimum value is **60** (1 minute); the maximum value is **315360000** (10 years); the default value is **10800** (3 hours). This field is required for IKE.
SA Lifetime Kbytes	Duration of the SA in Kbytes. The minimum value is **100**; the maximum value is **2147483647**; the default value is **51200** (50 MB).
Unspecified	Indicates the Security Association will not be expired based on the **SA Lifetime Kbytes** type. Represents a value of **0**. If this box is checked, only **SA Lifetime Seconds** will be used.

Notes:

- IKE aggressive mode does not support negotiation of multiple Diffie-Hellman groups; therefore, the Default IKE Strategy will not work with IKE aggressive mode exchanges. Use the preloaded Aggressive strategy or create a new strategy to use with secure channels that specify aggressive mode.
- IKE aggressive mode does not support negotiation of multiple authentication methods; therefore, secure channels that use aggressive mode should configure either preshared secret or certificates, but not both.
- IKE Aggressive Mode exchanges through a NAT device using pre-shared keys are not supported. This is true even if NAT-Traversal is enabled. Use RSA or DSA signature authentication (i.e. certificates) for IKE Aggressive Mode exchanges through a NAT device. Use IKE Main Mode for exchanges through a NAT device when using pre-shared keys.

IPSec Protection Strategies Window

Use the IPSec Protection Strategies window to define one or more groups of cryptographic properties as an IPSec protection strategy. The list represents a priority-ordered set of IPSec parameters. The first grouping in the list has highest priority. During the negotiation process, the IPSec Protection Strategy is negotiated between the CyberGuard VPN and its peer. For the negotiation to be successful, one of the groupings will be agreed upon and its parameters will be used. The successful negotiation of an IPSec Protection Strategy results in an IPSec SA (Security Association) between the CyberGuard VPN and the peer.

IPSec Protection Strategies are displayed on the IPSec page of the Packet-Filtering Rules window so that packet-filtering rules can be protected by the cryptographic properties configured in this window.

Note: Manual keying requires that only one parameter grouping be defined in the IPSec Protection strategy.

Four sample IPSec Protection Strategies are preloaded on the CyberGuard VPN so that users will be able to create tunnels immediately:

Default Propose all (stronger security first)

HighSecurity Limit choices to the more secure algorithms

EncryptOnly Encryption only (do not apply HMAC to packets)

AuthOnly Authenticate only (do not encrypt packet data)

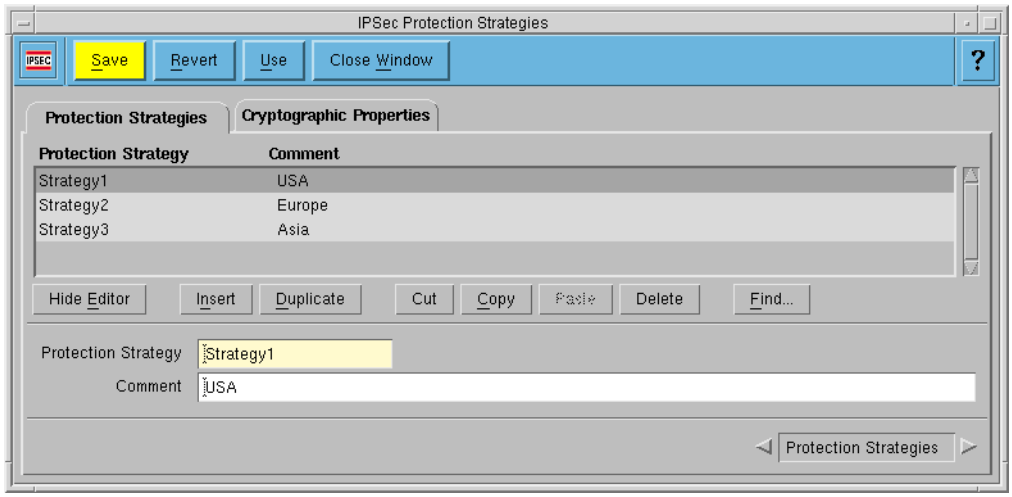


Figure II-91. IPSec Protection Strategies Window - Protection Strategies Page

IPSec Protection Strategies - Protection Strategies Page

Use this page of the IPSec Protection Strategies window to create protection strategy names to which to add cryptographic properties.

This page has the following fields:

Protection Strategy — User-defined name for an IPSec protection strategy. A list of Protection Strategies represents a priority-ordered set of IPSec parameters. The first grouping in the list has highest priority.

Comment — Describes the purpose of the IPSec protection strategy.

IPSec Protection Strategies - Cryptographic Properties Page

Use this page of the IPSec Protection Strategies window to configure cryptographic properties for an IPSec protection strategy.

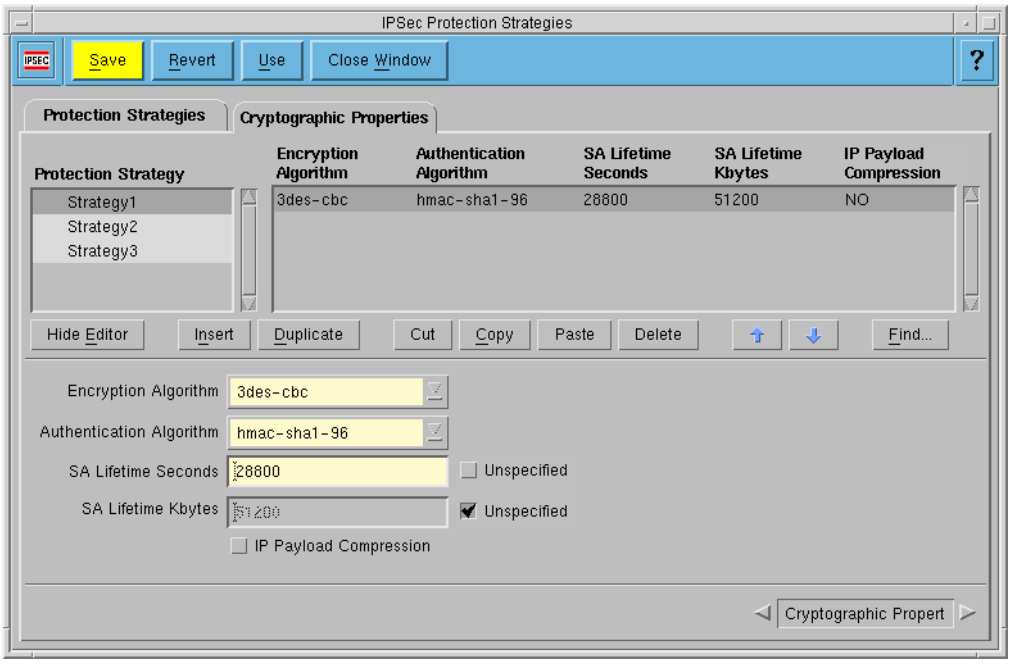


Figure II-92. IPSec Protection Strategies Window - Cryptographic Properties Page

This page has the following fields and controls:

Protection Strategy Displays a list of Protection Strategies defined on the Protection Strategies page. Select a Protection Strategy to configure its cryptographic properties.

Encryption Algorithm Displays a list of encryption algorithms. The supported algorithms are: **3des-cbc**, **des-cbc**, **aes-cbc**, **twofish-cbc**, **blowfish-cbc**, **cast128-cbc**, and **none**. **none** may be specified only if the **Authentication Algorithm** is not equal to **none**. The default value is **3des-cbc**.

Authentication Algorithm Displays a list of HMACs. The supported HMACs are: **hmac-sha1-96**, **md5**, **hmac-md5-96**, and **none**. **none** may be specified only if the **Encryption Algorithm** is not equal to **none**. The default value is **hmac-sha1-96**.

SA Lifetime Seconds Duration of the SA in seconds. The minimum value is **60** (1 minute); the maximum value is **315360000** (10 years); the default value is **28800** (8 hours).

Unspecified Indicates the Security Association will not be expired based on the **SA Lifetime Seconds** type. Represents a value of **0**. If this box is checked, only **SA Lifetime Kbytes** will be used. **Unspecified** cannot be checked for both **SA Lifetime Seconds** and **SA Lifetime Kbytes**.

SA Lifetime Kbytes Amount of traffic that can be protected by the SA in Kbytes. The minimum value is **100**; the maximum value is **2147483647**; the default value is **51200** (50 MB).

Unspecified Indicates the Security Association will not be expired based on the **SA Lifetime Kbytes** type. Represents a value of **0**. If this box is checked, only **SA Lifetime Seconds** will be used. **Unspecified** cannot be checked for both **SA Lifetime Seconds** and **SA Lifetime Kbytes**.

IP Payload Compression Using the IP Payload Compression algorithm (IPCOMP), compresses IP payload to counteract the overhead introduced by the IPSec protocol.

VPN Client Configurations Window

When a remote host connects to the firewall using a VPN client, it may be desirable for the host appear to be present on an internal network. The VPN Client Configurations window specifies the appropriate network configuration for the VPN client to operate on the private side of the firewall. These network attributes can include an IP address, netmask, the DNS server, and the WINS server. The firewall/VPN gateway dynamically assigns these private network attributes to the VPN client.

A single contiguous address pool is configurable per secure channel definition. Note that because there is only one host-type secure channel possible per network interface, only one address pool is configurable per network interface. Addresses can not be reserved for a particular VPN client; VPN clients are assigned the next available address from the pool.

After the IKE SA is deleted, the VPN client's address must be returned to the address pool. The IKE SA may be deleted through SA expiration, forced removal through the **Delete All SAs** button on the VPN Controls window, or due to a delete notification message from the client.

The VPN client internal address assignment is audited and messages associated with the client configuration are logged to the IKE log.

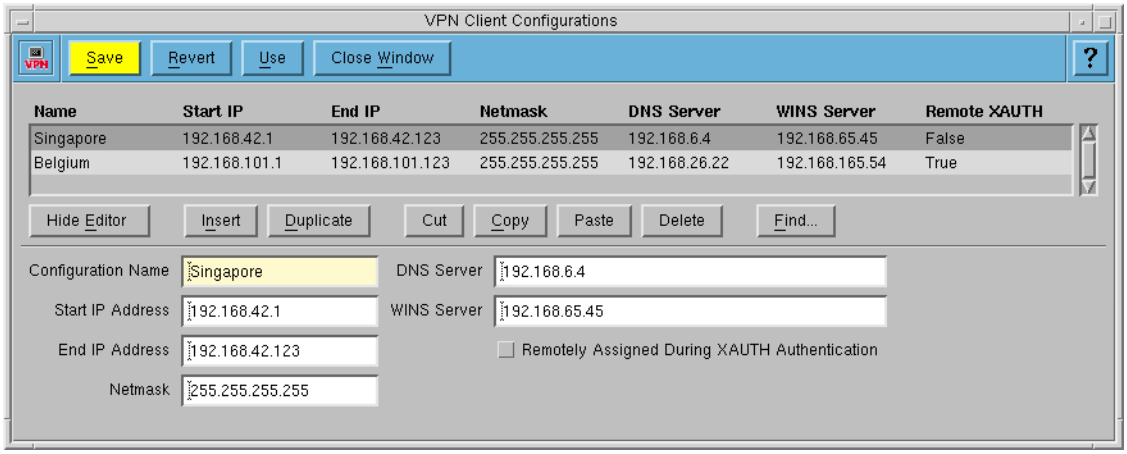


Figure II-93. VPN Client Configurations Window

This window contains the following fields and controls:

Configuration Name — Unique name used to identify a single virtual network configuration.

Start IP Address — (Optional) Specifies the lowest IP address available in the virtual network. This field is required if the **End IP Address** is given. The start-end address range must be contained within the network defined by the **Netmask**.

End IP Address (Optional) Specifies the highest IP address available in the virtual network. This field is required if the **Start IP Address** is given. The start-end address range must be contained within the network defined by the **Netmask**.

Netmask (Optional) Specifies the virtual network mask. This field is required if the **Start IP Address** and **End IP Address** are given. The start-end address range must be contained within the network defined by the **Netmask**.

DNS Server (Optional) Specifies the IP address or host name of the DNS server that is serving the client in the virtual network.

WINS Server (Optional) Specifies the IP address or host name of the WINS server (NetBios Name Server) that is serving the client in the virtual network.

Remotely Assigned During XAUTH Authentication
Configuration can be defined by a remote system that is running an extended authentication (XAUTH) server such as RADIUS or LDAP.

Note that when Remote Authentication is configured to provide client configuration attributes, those attributes take precedence over address attributes configured in the local VPN Client Configuration. If Remote Authentication is configured but no client configuration attributes are supplied by the authentication service, VPN Client Configuration will attempt to find the attributes to use from the local configuration. If any attributes are supplied by Remote Authentication, only the attributes supplied are used.

For information on configuring the VPN Client Configuration remote authentication with RADIUS, see "How to Configure Remote Authentication" on page II-177. For information on configuring the VPN Client Configuration remote authentication with LDAP, see "How to Configure Remote Authentication with LDAP" on page I-304.

Notes:

- To enable the SafeNet SoftRemote® client, the **Virtual Adapter** should be set to **Required** under **My Identity** of the Connection; and the SoftRemote client should NOT be configured to Allow to Specify Internal Network Address (under Options/Global Policy Settings); The IKE-mode-config exchange is initiated by vpnguard when the SoftRemote client starts its Phase-2 (IPSec) negotiation. The IKE Exchange Logging feature in the VPN Controls window can be used to track the progress of the CFG mode exchange.
- When the SoftRemote client initiates the FIRST phase-2 (Quick Mode) negotiation, it has not yet been given the IKECFG-assigned address to use; therefore, it connects using its physical address as the phase-2 identity. The exchange should fail (no proposal chosen) because no connection block contains the client's physical address. This behavior is normal.

See also:

- “VPN Client Configuration” on page II-240
- “Extended Authentication (XAUTH)” on page II-241
- “VPN Secure Channels - IKE Advanced Settings Dialog Box” on page II-267
- “VPN Controls Window” on page II-279
- “RADIUS” on page II-150
- “How to Configure RADIUS” on page II-173
- “LDAP Authentication Window” on page I-297

VPN Secure Channels Window

The VPN Secure Channels window allows the user to enter configuration information for a VPN Secure Channel. The secure channels created with this window are used by the packet filter to attempt to automatically identify the secure channel that governs the traffic defined in the packet filtering rule.

The secure channels defined in this window can also be manually selected in the Packet-filtering Rules window in the fields associated with the **Enable Manual Selection of VPN Secure Channel** option. This control should be exercised if the packet origin and/or the packet destination specified in the packet-filtering rule are insufficient to identify an IPSec peer (for example, no peer-protected networks have been defined), or the peer that the CyberGuard VPN would choose automatically is not the one the administrator wants.

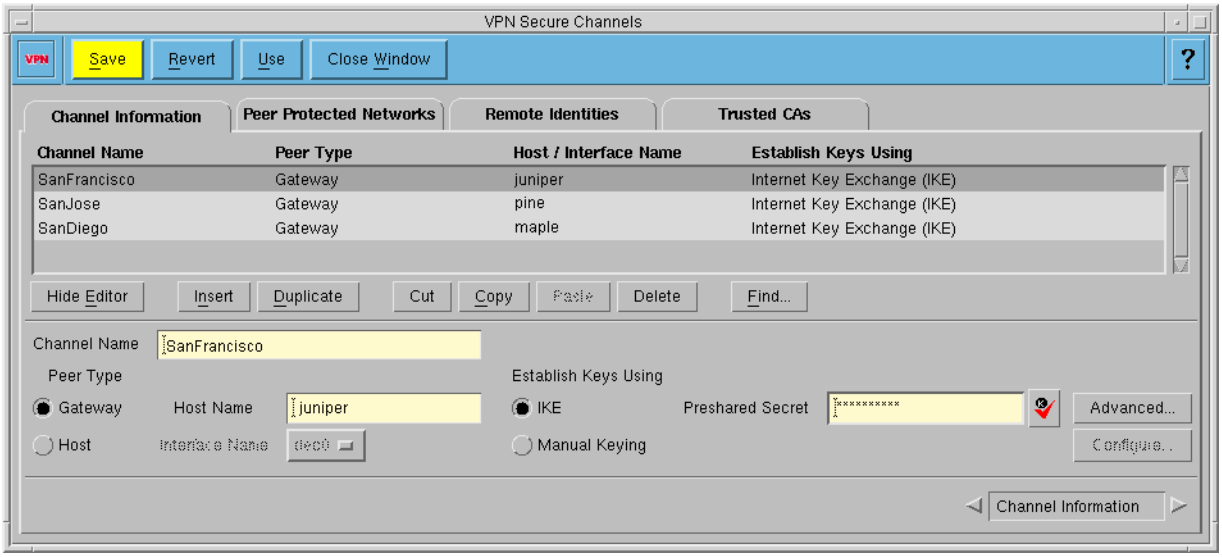


Figure II-94. VPN Secure Channels Window - Channel Information Page

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Packet-Filtering Rules Basic Page" on page II-23
- "Packet-Filtering Rules IPSec Page" on page II-29

VPN Secure Channels - Channel Information Page

Use this page of the VPN Secure Channels window to define secure channels to IPSec peers and determine the method to establish authentication keys. This is the first step the user must take to configure VPN.

This page has the following fields and controls:

Channel Name — User-defined name of the secure channel between the VPN host and peer. Numbers, letters, and underscores are permitted in this field. Values from this field appear in the **To Packet Origin** and the **To Packet Destination** fields on the IPSec page of the Packet-Filtering Rules window.

Peer Type — Configures the secure channel between the firewall and a gateway or the firewall and a host:

Gateway - The peer has a known IP address as in the case of a security gateway. Selecting this Peer Type activates the **Host Name** field.

Host - The peer does not have a static IP address as in the case of a traveling employee running VPN client software. Selecting this Peer Type activates the **Interface Name** field.

Host Name — Host name or IP address of the IPSec peer. The host name must be defined in the Host Names window; the resolved IP address must be routable.

Interface Name — Device through which VPN client connections are accepted. If interfaces have been properly configured on the firewall, a list of interfaces will be displayed.

Establish Keys Using

Establishes authentication using IKE or Manual Keys. See "IKE and Manual Keying" on page II-238 for more information.

IKE - Indicates that IKE will be used to negotiate SA attributes with the peer. If this option is selected, **Preshared Secret** and **Advanced** are activated.

Manual Keying - Indicates that keys will be entered manually to establish SA attributes with the peer. A secure channel that uses manual keying can only be used by one packet-filtering rule. If this option is selected, the **Configure** box is activated. Only the **Gateway** peer type can use manual keying.

Preshared Secret Authentication data to be used with IKE. The preshared secret can be either a plain text string or a hexadecimal integer beginning with the characters **0x**. Hexadecimal integers must have an even length. If text is entered in this field and the **Advanced** button is clicked, its value is copied into the **Preshared Secret** field in the **IKE Advanced Settings** dialog box. The value typed into this field is masked. This field may contain up to 128 characters.

A confirmation icon appears to the right of this field. A red check mark indicates that the key has not been confirmed. Click on the button, and a popup window with a confirmation field appears. A yellow icon indicates that the key is the process of being confirmed. If the value entered in the confirmation popup matches the **Preshared Secret** value, the icon turns green, indicating that the key has been confirmed.

Two methods of authentication are supported: preshared secret and certificates. Certificates are activated by clicking the **Advanced** button. If certificates and preshared secret are both configured, the CyberGuard VPN will attempt to use certificates before the preshared secret.

Advanced... When **Establish Keys Using IKE** is selected, this button is activated. Clicking this button opens the **IKE Advanced Settings** dialog box that can be used to change the IKE defaults. See "VPN Secure Channels - IKE Advanced Settings Dialog Box" on page II-267.

Configure... Opens the Manual Key Configuration dialog box. This window can be used to configure settings for inbound and outbound manual keying. Manual keying is used instead of IKE under special circumstances. This button is displayed in yellow when manual keys have not been entered and gray when manual keys have been entered. See "VPN Secure Channels - Manual Key Configuration Dialog Box" on page II-271.

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Packet-Filtering Rules Basic Page" on page II-23
- "Packet-Filtering Rules IPSec Page" on page II-29
- "IKE and Manual Keying" on page II-238
- "VPN Secure Channels - IKE Advanced Settings Dialog Box" on page II-267
- "VPN Secure Channels - Manual Key Configuration Dialog Box" on page II-271

VPN Secure Channels - IKE Advanced Settings Dialog Box

This window appears when the **Advanced...** button on the Channel Information page of the VPN Secure Channels window is selected. Use this window to configure parameters that govern the IKE interaction between the CyberGuard VPN and any peer that uses this specific channel.

See “Internet Key Exchange (IKE)” on page II-238 for information about authenticating with preshared secrets and certificates and IKE data.

During the authentication process, the CyberGuard VPN and the peer will exchange certificates as a method of identifying themselves. After obtaining the peer’s certificate, the firewall will scrutinize the certificate’s validity. Part of this process is to examine if the CA that issued the peer’s certificate is trusted by the firewall. The firewall administrator will designate which CAs are trusted using the Trusted CAs page in the VPN Secure Channels window.

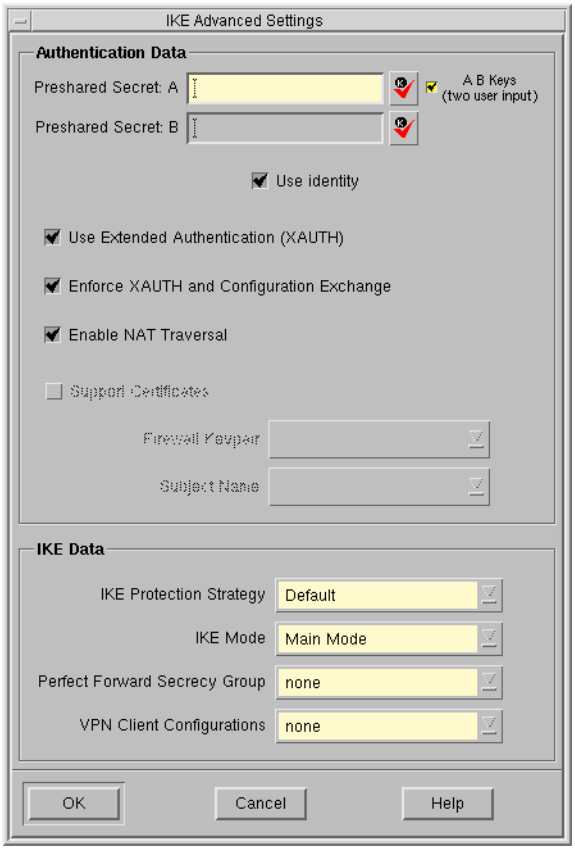


Figure II-95. IKE Advanced Settings Dialog Box

This page has the following fields and controls:

Preshared Secret — If the **Preshared Secret** field is completed on the VPN Secure Channels window, that masked value appears in this field. The preshared secret can be either a plain string or a hexadecimal integer beginning with the characters **0x**.

Hexadecimal integers must have an even length. This field may contain up to 128 characters.

A confirmation icon appears to the right of this field. A red check mark indicates that the key has not been confirmed. Click on the button, and a popup window with a confirmation field appears. A yellow icon indicates that the key is the process of being confirmed. If the value entered in the confirmation popup matches the **Preshared Secret** value, the icon turns green, indicating that the key has been confirmed.

The firewall administrator must agree on and securely communicate a secret phrase with the administrator of the peer, because the same preshared secret must be configured on the peer system. Although using a preshared secret is easy to configure, the burden of securely sharing this secret becomes prohibitive as the number of peers increases. Using certificates for authentication is more manageable.

A B Keys (two user input) Accommodates the entry of a **Preshared Secret** by two Firewall Security Officers (FSOs). If this box is checked, the following fields are displayed: **Preshared Secret A** and **Preshared Secret B**. The first FSO enters Preshared Secret A and logs out. The second FSO then logs in and enters Preshared Secret B. Until both parts of the preshard secret (A and B) are supplied, the channel cannot be used.

Use identity When **Preshared Secret** has been chosen as the authentication method, **Use identity** causes IKE Phase 1 to send the local gateway address (the firewall's network interface to the tunnel) in the Identity payload. This is one of the identity types (i.e., IP address) that can be verified by the remote peer, if the remote peer is a CyberGuard VPN and configures it in the Remote Identities page of the VPN Secure Channels window. This box is checked by default.

Use Extended Authentication (XAUTH)
Specifies that the user at the remote VPN client must authenticate (via an XAUTH IKE exchange) with the VPN policy Manager (vpnguard) before the client is allowed to establish VPN tunnels. The user name and password are validated via firewall authentication rules. Additional challenges from the firewall authentication (e.g., password expiration/enter new password) are not supported and are treated as authentication failure. Authentication success/failure is audited to the proxy_ia (network) audit event. See "Extended Authentication (XAUTH)" on page II-241 and "VPN Client Configurations Window" on page II-262.

Enforce XAUTH and Configuration exchange

If enabled, all VPN clients must successfully participate in the ISAKMP (IKE) Configuration Method exchanges (e.g., XAUTH) to establish a VPN connection. If disabled, VPN clients that are not recognized as supporting XAUTH and IKECFG are allowed to connect without participating in the ISAKMP (IKE) Configuration Method exchanges.

Enable NAT Traversal

By default, the firewall/VPN will participate in NAT discovery and perform NAT Traversal if NAT is discovered. If disabled, the firewall does not participate in NAT discovery and will not attempt NAT Traversal. See "VPN and NAT-Traversal (NAT-T)" on page II-249.

Support Certificates

Supports certificates for authentication. Checking this box activates the **Firewall Keypair** and **Subject Name** fields. A certificate is a publicly known, electronic document that binds a user's identity with his digital signature. A certificate is issued by a Certification Authority (CA). CAs known by the Firewall have been defined using the Trusted CA page of the IKE Certificate Management window. See "Internet Key Exchange (IKE)" on page II-238 for an explanation of CAs and "Certificate Management Window" on page II-292.

Firewall Keypair

Specifies the firewall's certificate that will be offered to the peer for authentication. The keypairs listed in this field are configured in the Keypairs page of the IKE Certificate Management window. See "Certificate Management - Keypairs Page" on page II-293.

Subject Name

Lists alternative subject names from the firewall keypair X.509v3 public key certificate. Choices include the fully qualified domain name (also referred to as the FQDN or DNS name) or the subject's email address (if they were specified in the certificate). This will be the subject name that is validated by the remote peer. The subject name specified is matched by the remote CyberGuard VPN with the list of authorized subjects defined by its remote identities in the Remote Identities page of the VPN Secure Channels window. See "VPN Secure Channels - Remote Identities Page" on page II-275.

IKE Protection Strategy

Lists IKE protection strategies previously defined in the IKE Protection Strategies window. This strategy consists of a user-defined name and a list of one or more priority-ordered sets of IKE parameters. The first set of parameters in the list has highest priority. During the IKE process, the IKE Protection Strategy is negotiated between the CyberGuard VPN and its peer. For the negotiation to be successful, one of the groupings listed in the IKE Protection Strategy will be agreed upon as the IKE parameters to be used. The successful negotiation of an IKE Protection Strategy results in an IKE SA (Security Association) between the

CyberGuard VPN and the peer. See “IKE Protection Strategies Window” on page II-256.

IKE Mode Method to use when the CyberGuard VPN is engaged in IKE Phase 1 negotiations.

Main mode - The more secure (and recommended) mode, main mode hides the identity of the negotiating parties.
Aggressive mode - Faster than main mode, but does not protect the identities of the negotiating nodes. See **Notes** below.

Perfect Forward Secrecy Group
Specifies a Diffie-Hellman group number that provides Perfect Forward Secrecy when negotiating new IPSec SAs during Phase 2 negotiations. PFS values are **none**, **1**, **2**, or **5**. The default is **none**, which indicates that PFS is not in effect. PFS exists if new keys have no mathematical relationship with existing keys. PFS enhances security because if a current key is compromised, it would be of no value in determining new keys because they are mathematically independent. Perfect Forward Secrecy is important for some applications but there is overhead associated with doing a Diffie-Hellman exchange at each re-key interval.

VPN Client Configuration Specifies the VPN client configuration that is defined in the VPN Client Configurations window. See “VPN Client Configuration” on page II-240 and “VPN Client Configurations Window” on page II-262.

Notes:

- IKE aggressive mode does not support negotiation of multiple Diffie-Hellman groups; therefore, the Default IKE Strategy will not work with IKE aggressive mode exchanges. Use the preloaded Aggressive strategy or create a new strategy to use with secure channels that specify aggressive mode.
- IKE aggressive mode does not support negotiation of multiple authentication methods; therefore, secure channels that use aggressive mode should configure either preshared secret or certificates, but not both.
- IKE Aggressive Mode exchanges through a NAT device using pre-shared keys are not supported. This is true even if NAT-Traversal is enabled. Use RSA or DSA signature authentication (i.e. certificates) for IKE Aggressive Mode exchanges through a NAT device. Use IKE Main Mode for exchanges through a NAT device when using pre-shared keys.

VPN Secure Channels - Manual Key Configuration Dialog Box

When defining a secure channel for a peer, the Firewall Administrator may choose to establish keys using Manual Keying rather than using IKE, which is the default mechanism. This is selected on the Channel Information page of the VPN Secure Channels window. The **Configure** button must be clicked in order to setup the manual keys. See "Manual Keying" on page II-239 for more information.

Notes:

- Manual keying requires that only one cryptographic property be defined in the IPSec Protection strategy. See "IPSec Protection Strategies - Cryptographic Properties Page" on page II-260.
- A secure channel that uses manual keying can only be used by one packet-filtering rule.
- IPSec SAs created by manual keying will be deleted by the **Delete All SAs** button in the VPN Controls window. See "VPN Controls Window" on page II-279.

Use this page of the VPN Secure Channels window to configure settings for inbound and outbound manual keying.

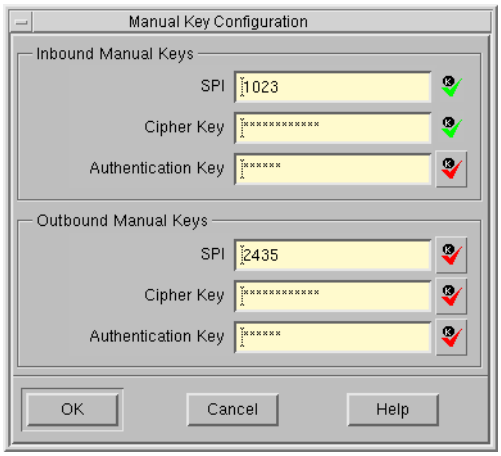


Figure II-96. Manual Key Configuration Dialog Box

This window has the following fields. These parameters define each set of manual keys for inbound and outbound traffic.

SPI — Security Parameter Index for inbound/outbound traffic from this secure channel. The SPI is a number that a system uses to identify a Security Association it is currently using to communicate with an IPSec peer. The SPI must be a decimal number greater than 255. This field may contain up to 10 characters.

Cipher Key — Key used by the encryption algorithm to encrypt or decrypt packets. The key must follow the rules specified below. This field may contain up to 128 characters.

Authentication Key Key used by the HMAC (Keyed-Hash Message Authentication Code) algorithm that is used to authenticate the packet. The key must follow the rules specified below. This field may contain up to 128 characters.

A confirmation icon appears to the right of each field. A red check mark indicates that the key has not been confirmed. Click on the button, and a popup window with a confirmation field appears. A yellow icon indicates that the key is the process of being confirmed. If the value entered in the confirmation popup matches the **Preshared Secret** value, the icon turns green, indicating that the key has been confirmed.

Rules for manual keys:

- Manual keys can be a hex or an ASCII string and must not exceed the maximum key length for the associated cryptographic properties.
- A hex string is represented by **0x** followed by a string of hex digits (0-9,a-f,A-F). The hex string is converted directly to hex data; therefore, the actual key length is 1/2 the number of characters in the configured string (not counting the **0x**).
- ASCII strings are converted to hex data, one character per byte in the key. ASCII key strings may be as long as the maximum key length for the cipher or hmac algorithm. Neither the colon (:) nor the double-quotation mark (") can be specified.
- The maximum key lengths (bytes) for the supported algorithms are:

Cipher Keys	Bytes
3des-cbc	24
aes-cbc	32
twofish-cbc	16
blowfish-cbc	56
cast128-cbc	16
des-cbc	8

HMAC (auth) keys	Bytes
hmac-sha1-96	20
hmac-md5-96	16

VPN Secure Channels - Peer Protected Networks Page

Use this page of the VPN Secure Channels window to enter a list of networks that will be protected by the peer. Configuring this page of the VPN Secure Channels window is optional, although highly recommended. The information specified on this page allows the packet filter to automatically determine the VPN Secure Channel to use for packet-filtering rules that are protected using IPSec.

If peer-protected networks are not defined, the firewall administrator must manually select the Secure Channel in the IPSec tab of the Packet Filtering Rules window. In order to identify networks protected by the peer, the firewall administrator is required to define a certain amount of information about networks and hosts that are not protected behind this

firewall. However, such “external” information is necessary for the firewall to participate in a Virtual Private Network.

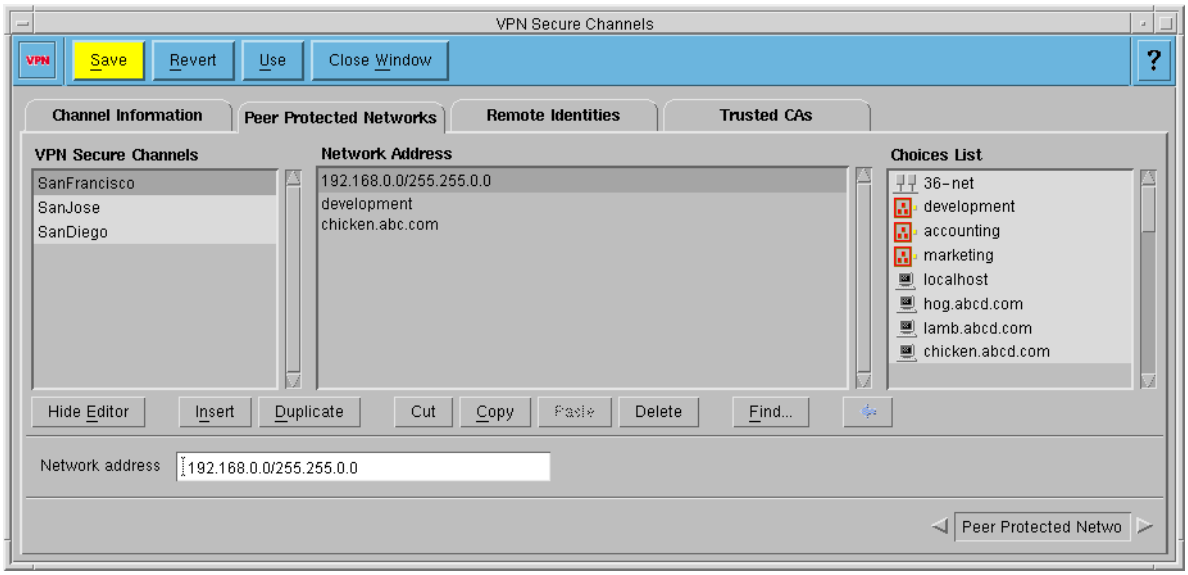


Figure II-97. VPN Secure Channels Window - Peer Protected Networks Page

This page has the following fields and controls:

VPN Secure Channels

Displays a list of the **Channel Names** configured on the Channel Information page of the VPN Secure Channels window. Select an VPN Secure Channel to configure its parameters on this page.

Network Address

Displays information entered in the **Network Address** field and choices selected from the **Choices List** on the right.

Choices List

Displays candidates for protection that can be selected and copied into the **Network Address** field using the left arrow button. For candidates to appear in this list, they must have been previously defined in the Host Names, Network Names, or Grouping windows.

Network Address

IP address, IP address range, IP subnetwork, host name, or group name to be protected by this VPN Secure Channel. Valid host names must be configured on the Host Names window.

The network identifier *device*_NETWORK is valid for peer protected networks

The following firewall network identifiers are *not* allowed because they specify objects associated with the local firewall and are not applicable to the remote peer. These identifiers are:

- FIREWALL, LOCAL_HOST, or BASTION_HOST
- INTERNAL_NETWORK

- EXTERNAL_NETWORK
- *device*_IPADDRESS
- INTERNAL_INTERFACES
- EXTERNAL_INTERFACES

For a description of these network identifiers, see "Packet Origins and Destinations" on page II-26.

Notes:

- For *device*_NETWORK to be a tunneled origin or destination, the origin or destination IP address of the target packet must have been routed through the *device* interface.
- If ALL_INTERNAL or ALL_EXTERNAL are used and they represent more than one *device*_NETWORK, the channel cannot be manually selected. Therefore, a default channel for each *device*_NETWORK must be configured by adding the *device*_NETWORK specification to the Peer Protected Networks of the appropriate VPN Secure Channel.
- The following rules apply to using a *device*_NETWORK as a Peer Protected Network:
  - The route to the remote gateway is through the *device* interface, or the host-type channel interface matches the *device* interface
  - Only one channel may use a particular *device*_NETWORK
- The automatic channel selection algorithm (virtual route) attempts to match an IPSec packet-filtering rule origin or destination address with the most specific Peer Protected Network definition. Configured *device*_NETWORK objects are matched only if no match is found within all peer protected host addresses, subnetwork addresses, and address ranges.
- Use host granularity on *device*_NETWORK rules if peer gateway rules are not as general (for example, rules that define specific subnetworks, hosts, etc.). Without a host granularity, *device*_NETWORK rules cause IKE to negotiate using a Phase 2 identity of `0.0.0.0/0` (any address), and this will only match a similar definition on the other side.

See also:

- "Host Names Window" on page II-1
- "Network Names Window" on page II-5
- "Grouping Window" on page II-10
- "Packet-Filtering Rules Window" on page II-22
- "Packet-Filtering Rules Basic Page" on page II-23
- "Packet-Filtering Rules IPSec Page" on page II-29

VPN Secure Channels - Remote Identities Page

The CAs known by the firewall are imported on the IKE Certificate Management window and designated as “trusted” on the Trusted CAs page of the VPN Secure Channels window. After these steps are completed, the CyberGuard VPN will accept a certificate from any user whose certificate was issued by a Trusted CA. On this page of the VPN Secure Channels window, the firewall administrator can restrict the users from whom the firewall will accept certificates.

Use this page of the VPN Secure Channels window to define remote identities that will be allowed to present a certificate during the authentication process. Do not use this page if all users presenting certificates are to be permitted.

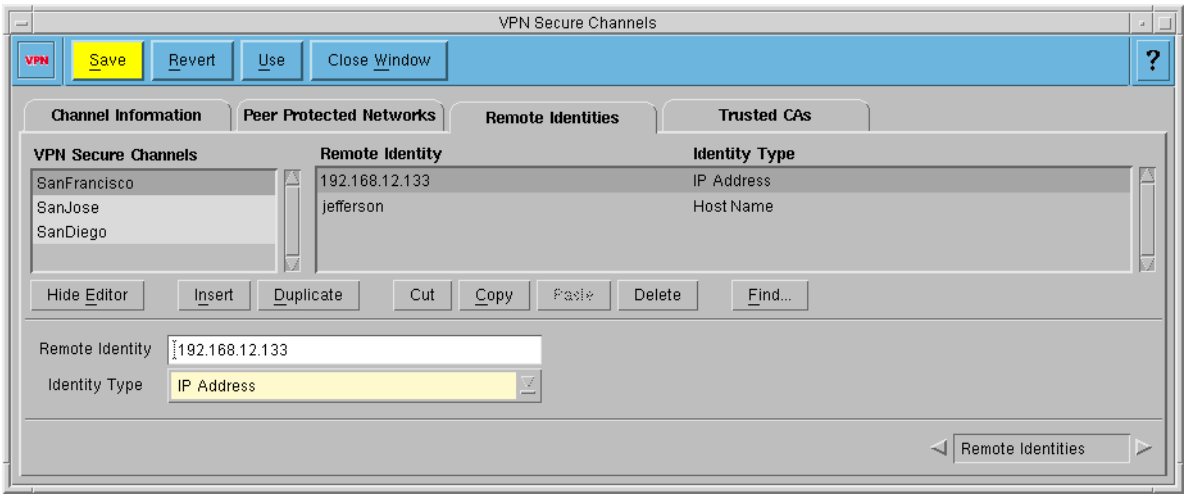


Figure II-98. VPN Secure Channels Window - Remote Identities Page

This page has the following fields and controls:

VPN Secure Channels — Displays a list of the **Channel Names** configured on the Channel Information page of the VPN Secure Channels window. Select a VPN Secure Channel to configure its parameters on this page.

Remote Identity — Remote identity to be used in the IKE authentication phase. Remote identities can be IP addresses, e-mail addresses, or host names.

Identity Type — The type of identity entered in the Remote Identity field. The following choices can be selected: **Host Name**, **Email address** or **IP address**.

VPN Secure Channels - Trusted CAs Page

During the authentication process, the CyberGuard VPN and the peer will exchange certificates as a method of identifying themselves. After obtaining the peer's certificate, the firewall will scrutinize the certificate's validity. Part of this process is to examine if the CA that issued the peer's certificate is trusted by the Firewall.

CA certificates are imported in the IKE Certificate Management window and displayed on the Trusted CAs page. Use this page of the VPN Secure Channels window to define the CA certificates that will be trusted during IKE negotiation for the secure channel being defined.

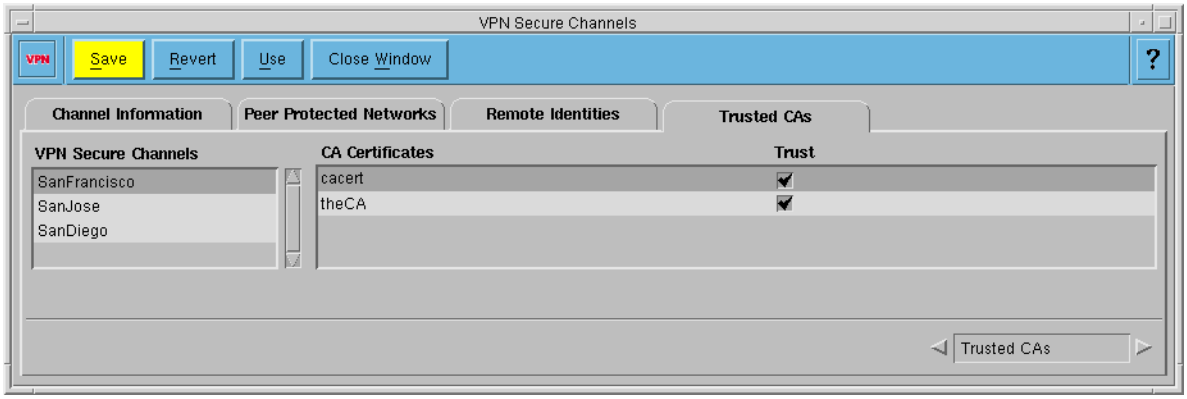


Figure II-99. VPN Secure Channels Window - Trusted CAs Page

This page has the following fields and controls:

VPN Secure Channels — Displays a list of the **Channel Names** configured on the Channel Information page of the VPN Secure Channels window. Select a VPN Secure Channel to configure its parameters on this page.

CA Certificates — Displays the names of CA certificates shown in the CA Certificates page of the IKE Certificate Management window.

Trust — Indicates that the CA certificates are trusted. By default, all certificates are trusted. Limit the trusted certificates by unchecking those certificates that should not be trusted. Make sure that the trusted CAs of the peer VPN gateway are also checked.

See also:

- "VPN Secure Channels - Channel Information Page" on page II-265
- "Certificate Management Window" on page II-292
- "Packet-Filtering Rules Basic Page" on page II-23
- "Packet-Filtering Rules IPSec Page" on page II-29

IKE Certificate Services Window

CAs can place certificates and CRLs on Lightweight Directory Access Protocol (LDAP) directories so that users can retrieve them. Applications can query Online Certificate Status Protocol (OCSP) responders to determine if a certificate is valid. Use this window to configure LDAP directories and OCSP responders.

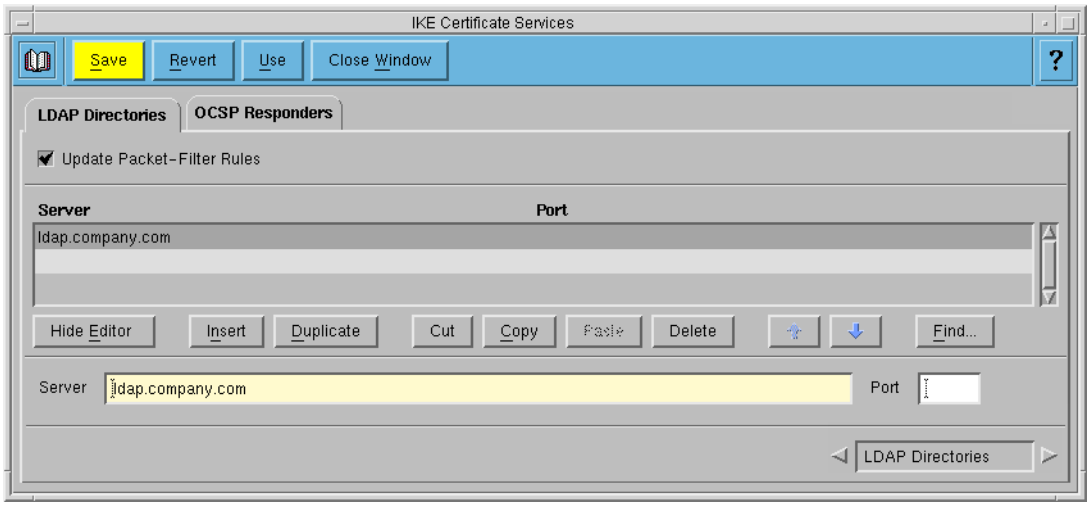


Figure II-100. IKE Certificate Services Window - LDAP Directories Page

IKE Certificate Services - LDAP Directories Page

Use this page of the IKE Certificate Services window to identify LDAP servers that can be used to obtain certificates.

This page contains the following fields and controls.

Update Packet-Filter Rules
Inserts packet-filtering rules to allow access to the LDAP directories specified on this page.

Server Fully qualified domain name or IP address of the LDAP server.

Port TCP port number of the LDAP server. A maximum of five characters (0-9) are permitted. The default is 389.

IKE Certificate Services - OCSP Responders Page

Online Certificate Status Protocol (OCSP) is a protocol defined in RFC 2560 and used by applications to query OCSP responders in order to find out if a certificate is valid. Use this page to identify the OCSP responders that the firewall may contact.

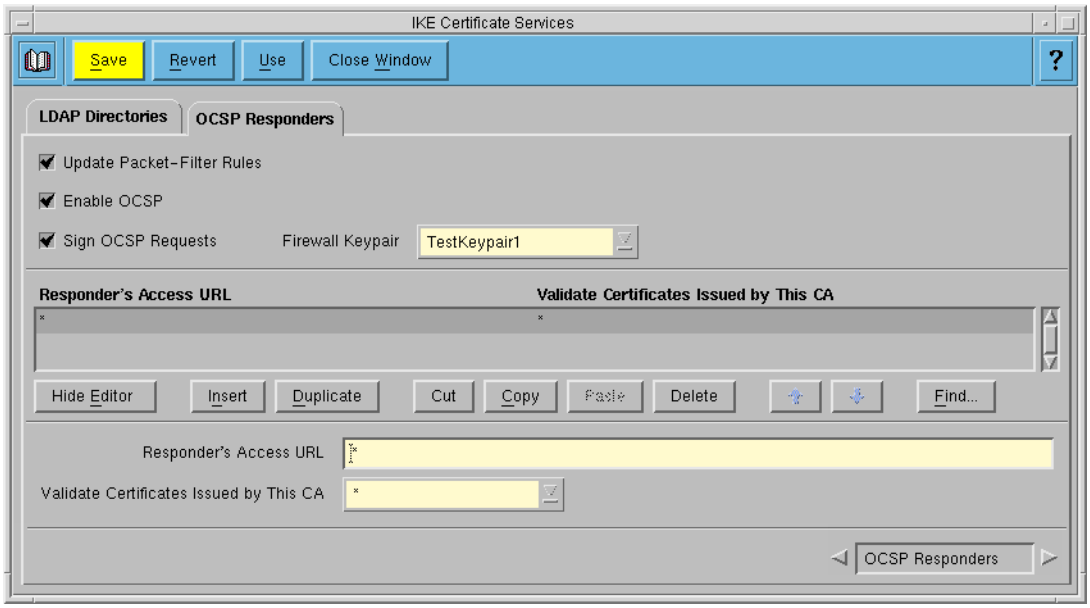


Figure II-101. IKE Certificate Services Window - OCSP Responders Page

This page contains the following fields and controls.

Update Packet-Filter Rules

Updates the firewall's packet-filtering rules to allow connections from the firewall to OCSP responders through HTTP. The default rules are:

If the default Responder's Access URL is used:

```
permit http/tcp  FIREWALL EVERYONE
```

If one or more specific Responder's Access URLs are used:

```
permit   http/tcp  FIREWALL  1st_responder_host/IP
permit   http/tcp  FIREWALL  2nd_responder_host/IP
```
...etc...

Enable OCSP Enables access to the OCSP responders defined on this page.

Sign OCSP Requests

Enables the signing of OCSP requests using the selected keypair from the **Firewall Keypair** drop-down list.

Firewall Keypair List of firewall keypairs configured on the Keypairs page of the IKE Certificate Management window. See “Certificate Management - Keypairs Page” on page II-293.

Responder’s Access URL
URL that points to an OCSP Responder. The wild card symbol * is also accepted and indicates that the URL must be found in the Authority Info Access X509v3 extension in the certificate being checked.

Validate Certificates Issued by This CA
List of currently installed CA certificates. This list also contains an asterisk (*) as the default list selection. If a CA certificate is selected from this list, only those certificates that were issued by this CA will be checked against the specified URL. If the asterisk is selected, checking is not performed and all certificates are checked against the specified URL if necessary.

Note: The order of OCSP responders is significant. OCSP responders will be queried in the order in which they appear on this page.

VPN Controls Window

Use this window to control the operation of the VPN policy manager and to start IKE Exchange Logging for troubleshooting VPN IKE negotiations.

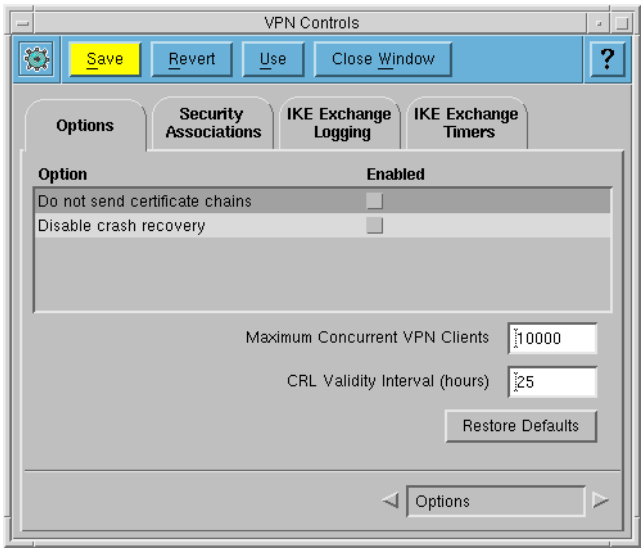


Figure II-102. VPN Controls Window - Options Page

VPN Controls Window - Options Page

Use this page of the VPN Controls window to control the operation of the VPN policy manager.

This page contains the following fields and controls.

Do not send certificate chains

Supports an IKE backward-compatibility mode needed for some Alcatel (TimeStep) VPN devices.

Disable crash recovery

Checking this box turns off the crash recovery feature.

Crash recovery provides the capability to react to situations where IKE/IPSec Security Associations (SAs) are deleted or missing in the VPN policy manager, yet delete notifications were not sent, or were not received by the VPN peer.

For gateway-to-gateway connections using preshared secrets, crash recovery works best if the **Use identity** check box is checked in the IKE Advanced settings window (selected from the VPN Secure Channels window).

Crash recovery works better if the IKE SA lifetime is kept relatively short (5 minutes/300 seconds).

Maximum Concurrent VPN Clients

Specifies the maximum number of VPN clients that are permitted at one time. The default is 10,000.

CRL Validity Interval (hours)

Time period in hours during which a CRL (Certificate Revocation List) is valid. The default is 25. 0 is not a valid value.

VPN Controls Window - Security Associations Page

Use this page of the VPN Controls window to delete Security Associations (SAs) and to display the SA information on the System Information window.

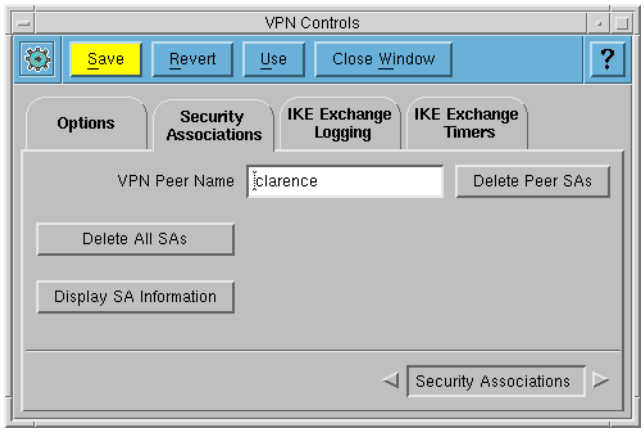


Figure II-103. VPN Controls Window - Security Associations Page

This page contains the following fields and controls.

VPN Peer Name — Host name or IP address of the peer to be deleted.

Delete Peer SAs — Deletes peer-specified SAs based on the host name or IP address. Type an IP address or host name in the blank field, and then push the **Delete Peer SAs** button. The result of the operation is displayed in a dialog box.

Delete All SAs — Deletes all active IPSec and IKE SAs. Delete notifications are sent to VPN peers.

Note: Clicking this button deletes IPSec SAs created by Manual Keys. See “VPN Secure Channels - Manual Key Configuration Dialog Box” on page II-271. To reestablish manually keyed SAs complete the following steps:

1. Select **Tools** from the Control Panel.

2. Select **Shell Window**.

3. Become root with the following command:

```
/sbin/tfadmin newlvl SYS_PRIVATE
su root
newlvl NETWORK
```

4. Issue the following commands:

```
vpnctl stop
netguard
```

or

1. Select **System** from the Control Panel.

2. Select **Reinitialize Network**.

Display SA Information Opens the System Information window and displays **General IPSec/IKE SA Information**.

See Also:

- "System Information Window" on page I-246
- "System Information Reports" on page I-247

VPN Controls Window - IKE Exchange Logging Page

Use this page of the VPN Controls window to start IKE Exchange Logging for troubleshooting VPN IKE negotiations.

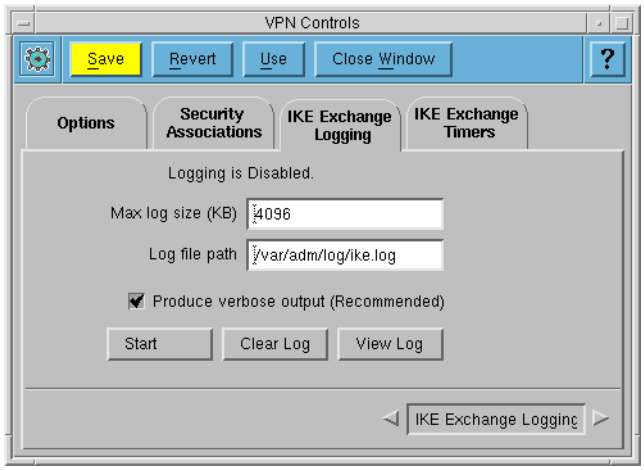


Figure II-104. VPN Controls Window - IKE Exchange Logging Page

This page contains the following fields and controls.

Logging is Enabled Indicates logging is being performed.

Logging is Disabled Indicates logging is not being performed.

Max log size (KB) Maximum size in kilobytes that the log file is allowed to grow to. The maximum value for this field is determined

by dividing the system's current maximum file size by 1024. The default is 4096 KB (4 MB).

Log file path — Absolute path of the location of the log file.

Produce verbose output — Produces a formatted log file that can be read and understood by an administrator. If this box is not checked, the log file entries are written in a format that is intended for parsing by awk/sed scripts. This box is checked by default.

Start/Stop — Starts and stops IKE exchange logging.

Clear Log — Clears the contents of the log file. Click on **Refresh** in the System Information Window after clicking this button to.

View Log — Opens the System Information window and displays the IKE Exchange Logging report. Click on **Refresh** in the System Information window after clicking this button to redisplay the current contents of the log file.

See Also:

- "System Information Window" on page I-246
- "System Information Reports" on page I-247

IKE Exchange Log

The IKE exchange log helps the system administrator to troubleshoot VPN IKE negotiations.

The content of the log assumes the user has some familiarity with the following RFCs:

RFC 2407 The Internet IP Security Domain of Interpretation for ISAKMP
RFC 2408 Internet Security Association and Key Management Protocol (ISAKMP)
RFC 2409 The Internet Key Exchange (IKE)

The log file contains the following fields:

Time (and date) — The time and date of the logged record. The time is formatted: *mm*/*dd*/*yy HH*:*MM*:*SS*.*FFF*, where *mm* is the month (01-12), *dd* is the day (01-31), *yy* is the last two digits of the year, *HH* is the hour (00-23), *MM* is the minute (00-59), *SS* is the second (00-59), and *FFF* is the fraction of seconds in milliseconds.

Cookies — The IKE Phase 1 SA identifier (16 octets). The format is:

initiator cookie-responder cookie

where the initiator and responder cookies are displayed in hexadecimal format, for example,

3f6e3c46.7d000003-2f86c3ce.ea000003

Exchange

The exchange mode, IKE role, packet direction, packet payloads, and IP address of the remote IKE peer.

The exchange mode is one of the following:

MM - Phase 1 Main Mode / Identity Protection
AM - Phase 1 Aggressive Mode
QM - Phase 2 Quick Mode
Info - Informational exchanges (for delete or notify payloads)

The role is initiator or responder, indicating the role played by the IKE daemon for this exchange. The packet direction indicates whether the IKE daemon is sending or receiving the exchange packet. The abbreviated payload descriptions reveal the types of IKE payloads sent or received, as specified in RFC 2408 (ISAKMP):

SA - Security Association
KE - Key Exchange
NONCE - Nonce
CR - Certificate Request
ID - Identity
CERT - Certificate
SIG - Signature
HASH - Hash digest
D - Delete
N - Notification
VID - Vendor ID

The order payload abbreviations are listed is arbitrary and does not represent the order of the payload in the IKE packet.

Local/Remote ID

The local and remote identity payload data are logged if the ID payload is present. The ID string is formatted as:

ID_type(*protocol_ID*:*port*,*identification_data*)

The *identification_data* will depend on the *ID_type*. The *ID_type* is typically one of the following:

fqdn - Domain name (my.company.com)
usr@fqdn - Email address (admin@my.company.com)
ipv4 - IPv4 address (10.0.0.1)
ipv4_subnet - IPv4 subnetwork address (10.0.0.0/8)
ipv4_range - IPv4 address range (10.0.0.1-10.0.0.9)

Other

This field contains additional information related to the exchange including SA attributes, error messages, and Phase 2 Security Parameter Indices (SPI).

Proposed SA attributes are not shown. Only the final, negotiated SA attributes are given. The negotiated SA attributes such as cipher, hash, and lifetime are provided by the responder (received by the initiator) on the second SA payload between IKE peers for

MM, AM, or QM exchanges.

Errors with certificate and certificate request payloads passed in the exchange may not produce precise messages. The user should consult the audit report for events related to errors detected by the VPN Certificate Manager.

The following is an example IKE log output for a QM exchange:

```
Time:         08/19/02 10:10:49.034
Cookies:      3f6e3c46.7d000003-2f86c3ce.ea000003
Exchange:     QM initiator sending SA ID HASH NONCE to 10.1.0.10
Local ID:     ipv4_subnet(any:0,192.168.7.0/24)
Remote ID:    ipv4_subnet(any:0,192.168.1.0/24)

Time:         08/19/02 10:10:49.037
Cookies:      3f6e3c46.7d000003-2f86c3ce.ea000003
Exchange:      QM initiator received SA ID HASH NONCE from 10.1.0.10
Local ID:     ipv4_subnet(any:0,192.168.7.0/24)
Remote ID:    ipv4_subnet(any:0,192.168.1.0/24)
Other:          ESP tunnel, 3des, hmac-sha1-96, No PFS, 300 sec, 0 KB

Time:         08/19/02 10:10:49.038
Cookies:      3f6e3c46.7d000003-2f86c3ce.ea000003
Exchange:     QM initiator sending HASH to 10.1.0.10

Time:         08/19/02 10:10:49.038
Cookies:      3f6e3c46.7d000003-2f86c3ce.ea000003
Exchange:     QM initiator completed exchange with 10.1.0.10
Local ID:     ipv4_subnet(any:0,192.168.7.0/24)
Remote ID:    ipv4_subnet(any:0,192.168.1.0/24)
Other:        Phase 2 complete. SPI (in,out): 2185ca30,498ad18a
```

VPN Certificate Events in the Log File

The log file contains the following log entries pertaining to VPN Certificate Events. These log entries contain the same information as VPN Certificate alerts and activities.

Time (and date) The time and date of the logged record. The time is formatted: *mm*/*dd*/*yy HH*:*MM*:*SS*.*FFF*, where *mm* is the month (01-12), *dd* is the day (01-31), *yy* is the last two digits of the year, *HH* is the hour (00-23), *MM* is the minute (00-59), *SS* is the second (00-59), and *FFF* is the fraction of seconds in milliseconds.

Cert Event A description of the VPN certificate event that occurred. The certificate events are:

Certificate Added - A certificate was added/found.
Certificate Revoked - A certificate was determined to be in the revoked/suspended state.
CRL Added - A CRL was added/found.
OCSP Status Check - The status of a certificate was checked against an OCSP responder.
OCSP Status Failure - An OCSP request failed.
Cert path verification error - The verification of a certificate revealed a problem (or problems).

The remainder of the Certificate Event log entry depends on the **Cert Event** field.

Certificate Added/Revoked Events:

Subject Name Distinguished name of the subject of the certificate.
Issuer Name Distinguished name of the issuer of the certificate.
Serial Number Serial number of the certificate.

CRL Added Events:

CRL Issuer Distinguished name of the issuer of the CRL.
This Update Date/Time when the CRL was issued.
Next Update The Date/Time when the issuance of the next CRL is scheduled.

OCSP Status Check:

Result The status of the certificate. There are three possible values for this field:

Certificate is good
Certificate is revoked
Certificate status is unknown

Subject Name Distinguished name of the subject of the certificate.
Issuer Name Distinguished Name of the issuer of the certificate.
Serial Number Serial number of the certificate.

OCSP Status Failure:

Error Message The reason why the OCSP check failed. These are the possible values for Error Message:

No responses were found
A nonce is required
The nonce did not match
The serial number did not match
The issuer key hash did not match
The timestamps that were indicated in the response were bad
The signature of the OCSP response was not verified
The responder is not authorized to sign responses
The responder search failed
Failure to receive an OCSP response

Subject Name Distinguished name of the subject of the certificate.
Issuer Name Distinguished Name of the issuer of the certificate.
Serial Number Serial number of the certificate.

Cert path verification error:

Error Message The reason why the certificate path verification failed.

Certificate algorithm mismatch
Certificate key usage mismatch
Certificate was not in the expected time interval
Certificate was invalid
Certificate had invalid signature
Certificate was revoked
Certificate was not added to the cache
Certificate decoding failed
Certificate was not found
Certificate chain did not reach trusted root CA
Certificate critical extension check failed
CA was invalid
CRL was too old
CRL was invalid
CRL had an invalid signature
CRL was not found
CRL was not added to the cache
CRL decoding failed
CRL thisUpdate time is in the future
CRL contained a duplicate serial number
Certificate validity interval was invalid
Time information was not available
Database search timeout
Database search failed
Path was not verified (chain validation failed)
Maximum path length reached

Subject Name	Distinguished name of the subject of the certificate.
Issuer Name	Distinguished Name of the issuer of the certificate.
Serial Number	Serial number of the certificate.

The following is an example IKE log output for VPN Certificate Events:

```
Time:              10/11/02 11:00:01.083
Cert Event:        Certificate Added
Subject Name:      C=us, O=CyberGuard Corporation, OU=Development, CN=valicert.cybg.com
Issuer Name:       C=US, O=CyberGuard Corporation, OU=Development, CN=Issuer 1 CA
Serial Number:     1034114040
Time:              10/11/02 11:00:01.085
Cert Event:        OCSP Status Check
Result:            Certificate is good.
Subject Name:      C=US, O=CyberGuard Corporation, OU=Development, CN=olyeller.cybg.com
Issuer Name:       C=US, O=CyberGuard Corporation, OU=Development, CN=Issuer 1 CA
Serial Number:     1034347741
```

Non-Formatted Log

The non-formatted logging option produces one line of output per each log entry. The fields are comma-separated values and represent the same data as described above for certificate events:

time:*mode*:*role*:*dir*:*payloads*:*remoteIP*:*localID*:*remoteID*:*cookies*:*other*

The time is formatted *mmddyyHHMMSS.FFF*, where *mm* is the month (01-12), *dd* is the day (01-31), *yy* is the last to digits of the year, *HH* is the hour (00-23), *MM* is the minute (00-59), *SS* is the second (00-59), and *FFF* is the fraction of seconds in milliseconds. The mode is MM, AM, QM or Info, as described above. The role is I for initiator or R for responder. The *dir* field species the packet direction (RX=received, TX=sending).

See Also:

- vpnrpt (1M)
- vpnctl (1M)

VPN Controls Window - IKE Exchange Logging Timers Page

Use this window to adjust IKE exchange retry parameters to that negotiations across networks with high latency are able to complete successfully.

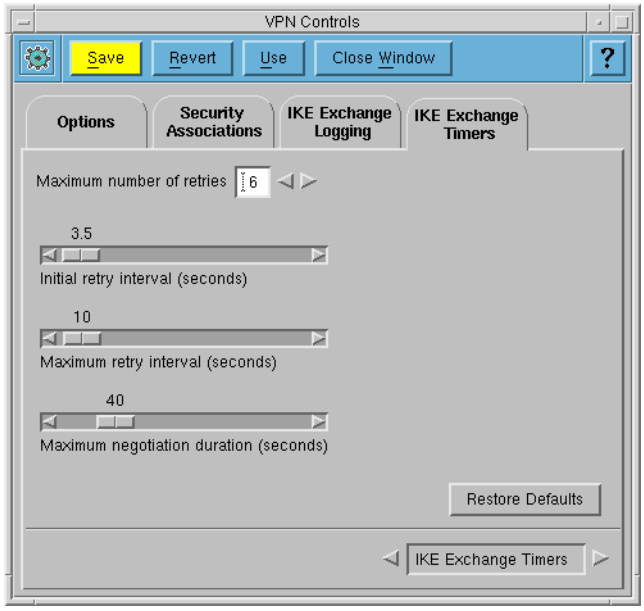


Figure II-105. VPN Controls Window - IKE Exchange Timers Page

This page contains the following fields and controls.

Maximum number of retries

Specifies the maximum number of retransmission packets that will be sent. The negotiation is aborted after this limit is reached.

Initial retry interval (seconds)

Specifies the the base interval for the retransmission packets. The first retransmission packet is sent after that time. The next packet is sent at 2^(retransmission packet number) * (**Initial retry interval**). For example, if the **Maximum number of retries** is 10, the **Initial retry interval** is 0.5, the first retransmission packet is sent out after 0.5 seconds, the second packet after is sent out after 1 second, and following packets after 2, 4, 8, 16, 32, 64, 128, and 256 seconds. After that, the negotiation times out.

Maximum retry interval (seconds)

Specifies the maximum time in seconds between retrasmission packets. For example if the **Maximum retry interval** is set to 30 seconds, the **Initial retry interval** is set to 0.5 seconds, and the **Maximum number of retries** is set to 10, the retransmission packets are sent after 0.5, 1, 2, 4, 8, 16, 30, 30, 30, and 30 seconds.

Maximum negotiation duration (seconds)

Specifies maximum time for the whole negotiation. After this time expires, the negotiation is immediately aborted.

Restore Defaults

Returns all controls on this page to their default values.

Certificate Request Wizard

The Certificate Request Wizard collects input from the user for a PKCS10 Certificate Request and then creates the request using the **openssl** command. The Certificate Request Wizard is started when **Certificate Request** is selected from the Tools menu.

The following wizards are also available to assist with certificate importing and exporting:

- "Firewall Keypair Import Wizard" on page II-293
- "Firewall Keypair Export Wizard" on page II-296
- "CA Certificate Import Wizard" on page II-298

The wizard consists of a series of forms that require user input before moving to the next form. The forms appear as follows:

Step 1. Enter the Subject Name

1. Enter a Subject Name either by entering familiar subject name attributes or by entering the complete Subject Name in LDAP DN (distinguished name) format. When entering the subject name in LDAP DN format, either the long form or the short form of the attributes may be specified. Each line should contain one attribute name followed by the equal sign and the value.

   The following subject name attributes may be specified multiple times in LDAP DN format: the **domainComponent** (dc) attribute and the **organizationalUnit** (OU) attribute. The **domainComponent** attribute can be specified more than once up to the number of times necessary to represent a complete domain name (e.g., `dc=cyber-guard`, `dc=com`). The **organizationalUnit** attribute can be specified up to four times.

   The following table lists the allowed attributes along with their maximum lengths:

Table II-4. LDAP DN Attributes Format

Long Name	Short Name	Max Length
countryName	C	2
commonName	CN	64
organizationName	O	64
organizationalUnitName	OU	32
localityName	L	64
stateOrProvinceName	ST	64
givenName	G	16
surname	S	40

Table II-4. LDAP DN Attributes Format

Long Name	Short Name	Max Length
name	name	64
initials	I	5
title	T	64
dnQualifier	dnQualifier	64
generationQualifier	generationQualifier	3
domainComponent	DC	64
emailAddress	email	128
pseudonym	pseudonym	128

2. Click on **Next**.

Step 2. Enter one or more Alternative Subject Names (optional)

1. Optionally enter one name for each supported type: **Email Address**, **DNS Name**, and **IP Address**. These names are optional and one or more text fields can be left blank.
2. Click on **Next**.

Step 3. Select a Public Key Algorithm and Public Key Length

1. From the drop-down list box, select the Public Key Algorithm to be used. Valid choices are RSA or DSA.
2. From the drop-down list box, select the Public Key Length.
3. Click on **Next**.

Step 4. Confirmation

The Confirmation form displays the user's choices and input for verification. If the information is correct, click on **Finish** to generate the PKCS10 request. To modify any choices, click on **Previous**.

Step 5. Summary

If the PKCS10 request was successfully created, the Summary form displays the file names of the saved PKCS10 request and the private key as well as the Base 64 (PEM) encoding of the PKCS10 Certificate Request. The Base 64 (PEM) encoding is selectable so that the Certificate Request can be copied to another X program such as a Web browser. The following buttons also appear on this form:

Copy to Clipboard Copies the certificate request to the clipboard. This text can be pasted into other programs by pressing the middle mouse button or by clicking the **Paste** button in the program's tool bar.

Save to File Displays the File Selection window to allow the user to specify a file name. The certificate request will be written to that file. See "File Selection Window" on page I-29.

Save to Diskette If a DOS-formatted diskette is in the floppy disk drive, the user is prompted to specify the DOS filename to which the certificate request will be saved.

Certificate Management Window

Use this window to import keypairs and certificates into the firewall for use in IKE authentication. Certificates that identify the CyberGuard VPN firewall or CA certificates can be imported with this window. A keypair is the pairing of a certificate with its corresponding private key. Keypairs are used to store the identity of the firewall. CA certificates are used to check the certificates that the firewall receives from its IPSec peer.

To create a certificate request, see "Certificate Request Wizard" on page II-290.

The following wizards are also available to assist with certificate importing and exporting:

- "Firewall Keypair Import Wizard" on page II-293
- "Firewall Keypair Export Wizard" on page II-296
- "CA Certificate Import Wizard" on page II-298

See "Internet Key Exchange (IKE)" on page II-238 for more information about CA certificates.

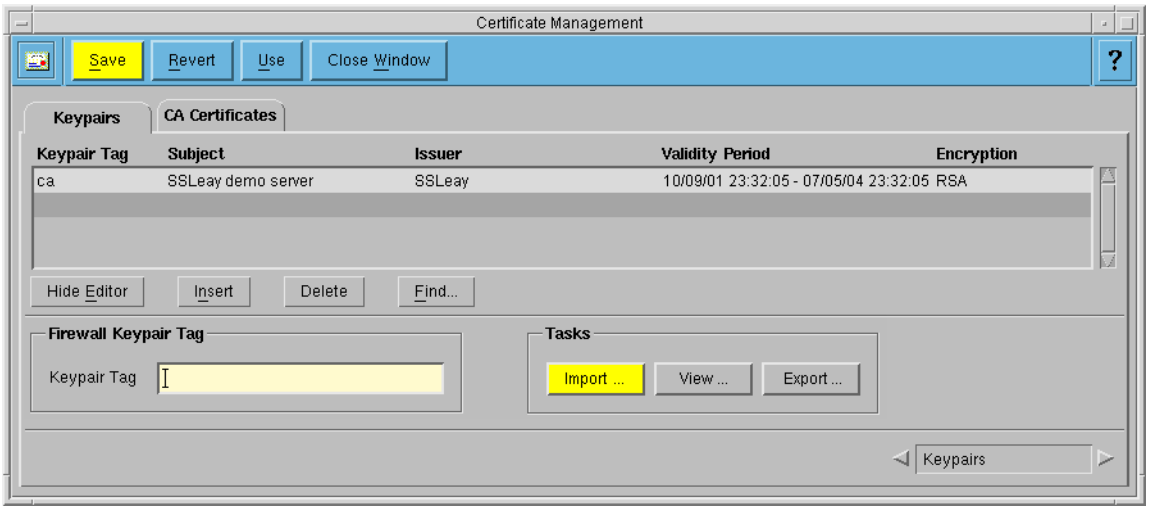


Figure II-106. Certificate Management Window - Keypairs Page

Certificate Management - Keypairs Page

Use this page of the IKE Certificate Management window to import or delete keypairs from the firewall. Keypairs are stored within a secure directory to restrict access to them.

This page has the following fields and controls:

Keypair Tag User-defined name for a keypair. When a keypair is imported, this name is used to rename certificate and private key files.

Import Begins the Firewall Keypair Import Wizard to copy PKCS12, PKCS7, and DER/PEM-encoded X.509 certificates and private keys into the correct directories in the format required by the firewall. See “Firewall Keypair Import Wizard” on page II-293.

View After a certificate has been imported, opens the Certificate Viewer window.

Export If a certificate has already been imported, begins the Firewall Keypair Export Wizard to write keypairs out to PKCS12 files. See “Firewall Keypair Export Wizard” on page II-296.

Firewall Keypair Import Wizard

Use the Firewall Keypair Import Wizard to copy PKCS12, PKCS7, and DER/PEM-encoded X.509 certificates and private keys into the correct directories in the format required by the firewall. The Firewall Keypair Import Wizard is started when the **Import** button is clicked on the Keypairs page of the Certificate Management window. To create a certificate request, see “Certificate Request Wizard” on page II-290.

The wizard consists of a series of forms that require user input before moving to the next form. The forms appear as follows:

For PKCS12:

Step 1. Select a certificate file format.

1. Select **PKCS12.**
2. Click on **Next**.

Step 2. Select a file

1. Type the absolute path name of the certificate in the **Filename** field or click on the **Browse** button to search the file system for the file.
2. Click on **Next**.

Step 3. Enter the PKCS#12 password.

1. Type a password in the **Password** field.
2. Re-type the password in the **Confirm Password** field to ensure that it was typed correctly.

3. Click on **Next**.

Step 4. Select the certificates to be imported.

1. If the PKCS12 file contains more than one certificate, a list of certificates is displayed. Select a certificate.
2. Click on **Next**.

Step 5. Confirmation.

The Confirmation form displays the user's choices and input for verification. If the Key-pair Import settings are correct, click on **Finish**. To modify any choices, click on **Previous**.

Step 6. Summary

The Summary form displays the names of the firewall certificate and any CA certificates that were imported.

For PKCS7 and PEM/DER-Encoded X.509 Certificates:

Step 1. Select a certificate file format

1. Select **PKCS7** or **X.509 Certificate**.
2. Click on **Next**.

Step 2. Select a method for importing the certificate

1. Choose from **Import from file** or **Copy and Paste**.
2. Click on **Next**.

Step 3. Select a file or paste the certificate text

1. Complete the next form:
   - If **Import from file** was selected, the Certificate Filename form appears. Type the absolute path name of the certificate or click on the **Browse** button to search the file system for the file.
   - If **Copy and Paste** was selected, the Certificate Text form appears. Copy the certificate text from the source and then click on **Paste from Clipboard** to paste the text into the form.
2. Click on **Next**.

Step 4. Select a private key file

The Private Key Filename form allows the user to specify a private key filename and to specify whether the private key is encrypted. If the private key is encrypted, this form allows the user to specify the password required to decrypt the private key. When importing private keys that were generated by the firewall, leave the **Decrypt private key** check box unchecked.

1. Type the absolute path name of the certificate or click on the **Browse** button to search the file system for the file.
2. If the private key should be decrypted, check **Decrypt private key**. Checking this box enables the **Password** and **Confirm Password** fields.
3. To unhide the password, clear **Mask password** which is checked by default.
4. Type the password in the **Password field** and again in the **Confirm Password** field.
5. Click on **Next**.

Step 5. Select the certificates to be imported

1. If the PKCS7 file contains more than one certificate, a list of certificates is displayed. Select a certificate.
2. Click on **Next**.

Step 6. Confirmation

The Confirmation form displays the user's choices and input for verification. If the Firewall Keypairs Import is correct, click on **Finish**. To modify any choices, click on **Previous**.

Step 7. Summary

The Summary form displays the names of the firewall certificate and any CA certificates that were imported.

Firewall Keypair Export Wizard

Use the Firewall Keypair Export Wizard to write keypairs out to PKCS12 files. The Firewall Keypair Export Wizard is started when the **Export** button is clicked in the Keypairs page of the Certificate Management window.

The wizard consists of a series of forms that require user input before moving to the next form. The forms appear as follows:

Step 1. Enter the PKCS12 output filename

1. Type the absolute path name or click on the **Browse** button to specify the location of the new PKCS12 file that will be created.
2. Click on **Next**.

Step 2. Enter the password

1. To hide the password, check **Mask password**.
2. Type the password in the **Password field** and again in the **Confirm Password** field.
3. Click on **Next**.

Step 3. Confirmation

The Confirmation form displays the user's choices and input for verification. If the Keypair Export is correct, click on **Finish**. To modify any choices, click on **Previous**.

Certificate Management - CA Certificates Page

Use this page of the IKE Certificate Management window to import, view, or delete CA certificates. To create a certificate request, see "Certificate Request Wizard" on page II-290.

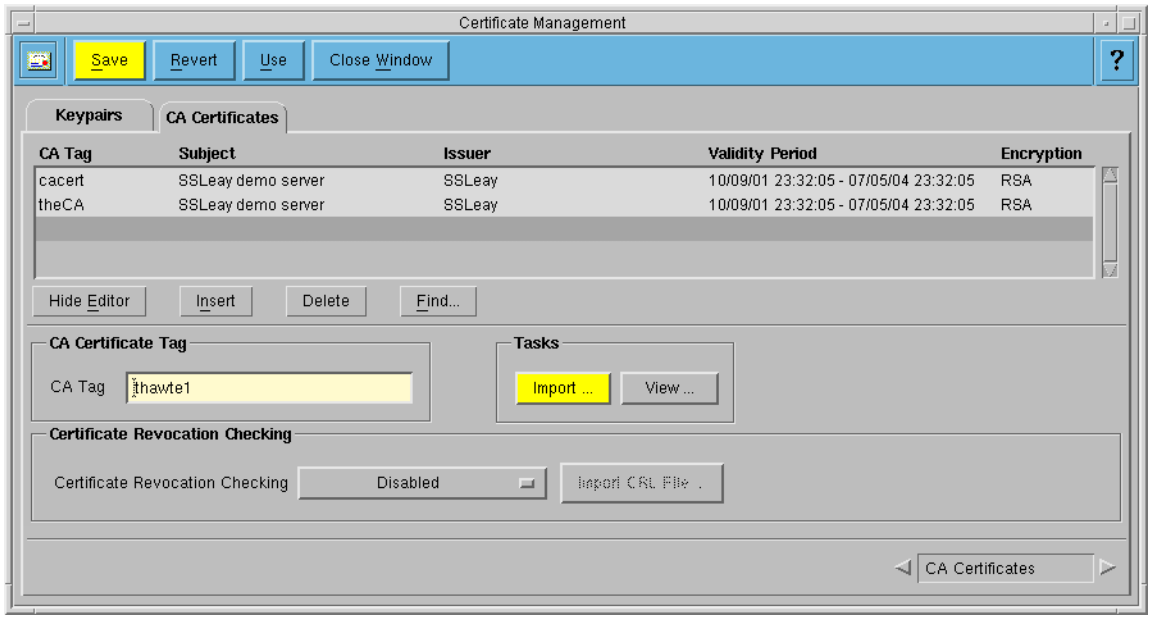


Figure II-107. Certificate Management Window - CA Certificates Page

This page has the following fields and controls:

CA Tag User-defined name for a CA public key certificate.

Import Starts the CA Certificate Import Wizard to import a PKCS7 or DER/PEM-encoded X.509 certificate in the format required by the firewall and copy it into the correct directory.

View Displays the Certificate Viewer window. This window displays information about a certificate along with the Base 64 (PEM) encoding of the certificate. Text within this window can be highlighted and copied in order to paste the text into another window or program.

Certificate Revocation Checking

Disabled - Indicates that CRL checking will not be performed for certificates that were signed by this CA.

CDP Extension in Certificate - Indicates that CRL checking will be performed and the CRL Distribution Point (CDP) X.509v3 extension will be checked to find where CRLs can be retrieved.

CRL File - Indicates that the user will specify a path to the CRL file already on the system.

Import CRL File

Displays a file selection box to allow the user to choose a CRL filename.

This button is activated when **CRL file** is selected from the **Certificate Revocation Checking** drop-down list. After clicking this button, the user is prompted for the file name of a CRL file. The file can be read from a floppy diskette or from a disk file.

CA Certificate Import Wizard

Use the CA Certificate Import Wizard to import a PKCS7 or DER/PEM-encoded X.509 certificate in the format required by the firewall and copy it into the correct directory. The CA Certificate Import Wizard is started when the **Import** button is clicked on the CA Certificates page of the Certificate Management window.

The wizard consists of a series of forms that require user input before moving to the next form. The forms appear as follows:

Step 1. Select a certificate file format

1. Select **PKCS7** or **X.509 Certificate**.
2. Click on **Next**.

Step 2. Select a method for importing the certificate

1. Choose from **Import from file** or **Copy and Paste**.
2. Click on **Next**.

Step 3. Select a certificate filename or copy/paste the certificate text

1. Complete the next form:
   - If **Import from file** was selected, the Certificate Filename form appears. Type the absolute path name of the certificate or click on the **Browse** button to search the file system for the file.
   - If **Copy and Paste** was selected, the Certificate Text form appears. Copy the certificate text from the source and then click on **Paste from Clipboard** to paste the text into the form.
2. Click on **Next**.

Step 4. Confirmation

The Confirmation form displays the user's choices and input for verification. If the CA Certificate Import is correct, click on **Finish**. To modify any choices, click on **Previous**.

Step 5. Summary

The Summary form displays the names of the CA certificates that were imported.

Configuring a Virtual Private Network

The sections that follow explain how to set up the most common VPN configurations: gateway-to-gateway, gateway to a VPN host with a known address, and gateway to a VPN host with an unknown address.

How to Configure a Gateway-to-Gateway VPN Firewall

Using as many defaults as possible, this procedure explains how to configure a VPN with an IPSec Gateway as its peer.

Step 1 - Define a Channel to the IPSec Peer

Begin by defining a channel to the IPSec peer that the CyberGuard VPN will communicate with.

1. Select **Configuration** from the Control Panel.
2. Select **VPN Secure Channels**. The VPN Secure Channels window appears.
3. Click on the **Channel Information** tab. The Channel Information page appears.
4. Click on **Show Editor**. The expanded Channel Information page appears.
5. Click on **Insert** to begin creating a new secure channel.
6. Type a name in the **Channel Name** field, for example, `HQ_gateway`.
7. Select **Gateway** as the **Peer Type**. An example of a gateway is another CyberGuard VPN.
8. Type the IP address or the host name of the peer in the **Host Name** field. If a host name is entered, it must be defined in the **/etc/inet/hosts** file.
9. Specify if the communication with the peer will use IKE (Internet Key Exchange, the key management protocol of IPSec) or Manual Keying. IKE is the default, and this procedure will use IKE.
10. Because IKE is selected, specify a mechanism for the firewall and the peer to authenticate one another. Typing a secret phrase in the **Preshared Secret** field requires the minimum amount of configuration. The firewall administrator must agree to and securely communicate this secret phrase with the administrator of the peer, because the same preshared secret must be configured on the peer system.

Step 2 - Identify Networks Protected by the Peer

Because the peer is a gateway, the next step is to identify the networks of interest that are protected by this peer. Although this step is optional, it is highly recommended because it enables the CyberGuard VPN to automatically determine the secure channel for each packet-filtering rule that is protected with IPSec.

1. Click on the **Peer Protected Networks** tab of the VPN Secure Channels window.
2. In the **VPN Secure Channels** list on the left side of the page, select a secure channel, such as `HQ_gateway` that was defined in Step 1.
3. Click on **Show Editor**.
4. Click on **Insert**.
5. In the **Network Address** field, type an IP address, IP address range, network name, IP subnet, host name, or group name that defines the entities protected by the peer gateway or use the **Choices List** to select the remote entities of interest. Note that for the remote entities to appear in this **Choices List**, they must have been previously defined in the Host Names, Network Names, or Grouping windows.

Step 3 - Define Packet-Filtering Rules

Define packet-filtering rules that will be protected using IPSec and the newly defined VPN Secure Channel.

1. Select **Configuration** from the Control Panel.
2. Select **Packet-Filtering Rules**. The Packet-Filtering Rules window appears.
3. Click on **Show Editor**. The expanded window appears.
4. Click on the **Basic** tab. The Basic page appears.
5. Enter the rules similar to the following:

```
permit   ALL   192.168.2.0/24    10.2.3.0/24
permit   ALL   10.2.3.0/24       192.168.2.0/24
```

6. For both rules, select the rule and check the **Protect using IPSec** option. To configure *device*_NETWORK type VPN rules, see “Packet-Filtering Rules IPSec Page” on page II-29.
7. Click on **Save**. Your changes take effect at the next system reboot.
8. (Optional) Click on **Use**. Your changes take effect immediately.

See also:

- “Host Names Window” on page II-1
- “Packet-Filtering Rules Window” on page II-22
- “Packet-Filtering Rules Basic Page” on page II-23
- “Packet-Filtering Rules IPSec Page” on page II-29

How to Configure a Gateway-to-Host VPN (Virtual Address)

Using as many defaults as possible, this procedure explains how to configure a VPN with a host (IPSec client) as its peer.

Step 1 - Define a Channel to the IPSec Peer

Begin by defining a channel to the IPSec peer that the CyberGuard VPN will communicate with.

1. Select **Configuration** from the Control Panel.
2. Select **VPN Secure Channels**. The VPN Secure Channels window appears.
3. Click on the **Channel Information** tab. The Channel Information page appears.
4. Click on **Show Editor**. The expanded Channel Information page appears.
5. Click on **Insert**.
6. Type a name in the **Channel Name** field, for example, `mylaptop`.
7. Select **Host** as the **Peer Type**. An example of a host is a single end-user machine, known as a VPN client.
8. Because the **Peer Type** is a **Host**, select the network interface of the firewall to which the peer (VPN client) will connect. For example, select `dec2` in the **Interface Name** list box.
9. Specify if the communication with the peer will use IKE (Internet Key Exchange, the key management protocol of IPSec) or Manual Keying. IKE is the default, and this procedure will use IKE.
10. Because IKE is selected, specify a mechanism for the firewall and the peer to authenticate one another. Typing a secret phrase in the **Preshared Secret** field requires the minimum amount of configuration. The firewall administrator must agree and securely communicate this secret phrase with the administrator of the peer, because the same preshared secret must be configured on the peer system.

Step 2 - Identify Networks Protected by the Peer

If the VPN client software supports a mapping of a virtual IP address to a physical IP address, the virtual IP address is analogous to the protected networks of a VPN gateway peer. If the virtual network of VPN hosts is known, it can be specified on the Peer Protected Networks page of the VPN Secure Channels window. Although this step is optional, it is highly recommended because it enables the CyberGuard VPN to automatically determine the secure channel for each packet-filtering rule that is protected with IPSec.

1. Click on the **Peer Protected Networks** tab of the VPN Secure Channels window.
2. In the **VPN Secure Channels** list on the left side of the page, select a secure channel, such as `mylaptop` that was defined in Step 1.
3. Click on **Show Editor**.
4. Click on **Insert**.
5. In the **Network Address** field, type the virtual IP address, IP address range, IP subnet, or host name that defines the host or use the **Choices List** to select the remote entities of interest. Note that for the remote entities to appear in this **Choices List**, they must have been previously defined in the Host Names, Network Names, or Grouping windows.

Step 3 - Define Packet-Filtering Rules

Define packet-filtering rules that will be protected using IPSec and the newly defined VPN Secure Channel.

1. Select **Configuration** from the Control Panel.
2. Select **Packet-Filtering Rules**. The Packet-Filtering Rules window appears.
3. Click on **Show Editor**. The Expanded Basic page appears.
4. Click on the **Basic** tab. The Basic page appears.
5. Enter the rules similar to the following:

```
permit   ALL   192.168.5.55/24    10.2.3.0/24
permit   ALL   10.2.3.0/24        192.168.5.55/24
```

6. For both rules, select the rule and check the **Protect using IPSec** option. To configure *device*_NETWORK type VPN rules, see “Packet-Filtering Rules IPSec Page” on page II-29.
7. Click on **Save**. Your changes take effect at the next system reboot.
8. (Optional) Click on **Use**. Your changes take effect immediately.

Note: Virtual addresses (addresses located on the remote end of a VPN tunnel) do not need to be routable; however, packet filter parsing generates warning messages for nonroutable addresses that it encounters. To avoid these warning messages, it is strongly recommended that you configure a default route.

See also:

- "Packet-Filtering Rules Window" on page II-22
- "Packet-Filtering Rules Basic Page" on page II-23
- "Packet-Filtering Rules IPSec Page" on page II-29

How to Configure a Gateway-to-Host VPN (Dynamic Address)

Using as many defaults as possible, this procedure explains how to configure a VPN with a host (IPSec client) as its peer, where the IP address of the host is unknown prior to it connecting to the firewall.

Step 1 - Define a Channel to the IPSec Peer

Begin by defining a channel to the IPSec peer that the CyberGuard VPN will communicate with.

1. Select **Configuration** from the Control Panel.
2. Select **VPN Secure Channels**. The VPN Secure Channels window appears.
3. Click on the **Channel Information** tab. The Channel Information page appears.
4. Click on **Show Editor**. The expanded Channel Information page appears.
5. Click on **Insert**.
6. Type a name in the **Channel Name** field, for example, `mylaptop`.
7. Select **Host** as the **Peer Type**. An example of a host is a single end-user machine, known as a VPN client.
8. Because the **Peer Type** is a **Host**, select the network interface of the firewall to which the peer (VPN client) will connect. For example, select `dec2` in the **Interface Name** list box.
9. Specify if the communication with the peer will use IKE (Internet Key Exchange, the key management protocol of IPSec) or Manual Keying. IKE is the default, and this procedure will use IKE.
10. Because IKE is selected, specify a mechanism for the firewall and the peer to authenticate one another. Typing a secret phrase in the **Preshared Secret** field requires the minimum amount of configuration. The firewall administrator must agree and securely communicate this secret phrase with the administrator of the peer, because the same preshared secret must be configured on the peer system.

Note: When the IPSec peer type is a host with an unknown IP address, the host cannot be specified on the Peer Protected Networks page. This limits the information the firewall has in attempting to automatically select an VPN Secure Channel for a particular packet-filter rule. Therefore, **Enable Manual Selection of VPN Secure Channel** will need to be configured for each applicable packet-filtering rule, on the IPSec page of the Packet-Filtering Rules window.

Step 2 - Define Packet-Filtering Rules

Create packet filtering rules that govern the interaction between the VPN firewall and the VPN client. Because the IP address of the client is not known, the Passport One mechanism is used to set up the packet-filtering rules. This allows use of the %USER construct so that the source IP address of the system from which the user made the authenticating connection is substituted into the packet-filtering rules.

1. Select **Configuration** from the Control Panel.
2. Select **Passport One**. The Passport One window appears.
3. Click on the **Setup** tab. The Setup page appears.
4. Check **Enable**.
5. Under **Enabled Interfaces**, check the firewall interface that corresponds to the interface selected in Step 1 (`dec2` in this example).
6. Accept the defaults for **HTTP** and **Telnet** (enabled), **Maximum Number of Sessions**, and **Refresh Interval**.
7. Click on the **Profiles** tab. The Profiles page appears.
8. Click on **Insert**.
9. Type a name in the **Profile Name** field.
10. Click on the **Rules** tab. The Rules page appears.
11. Enter packet filtering rules for the **Profile Name**. Use the %USER construct to identify the IP address of the host (VPN client).
12. Check the option **Protect using IPSec**. To configure *device*_NETWORK type VPN rules, see “Packet-Filtering Rules IPSec Page” on page II-29.
13. For each Option using %USER:
    c. Click on the **IPSec** tab.
    d. If %USER is in the **Packet Origin** field of the packet-filtering rule, click on the **To Packet Origin** box in the **Enable Manual Selection of VPN Secure Channel** section. Then select the Secure Channel for this rule.
    e. If %USER is in the Packet Destination field of the packet-filtering rule, click on the **To Packet Destination** box in the **Enable Manual Selection of VPN Secure Channel** section. Then select the Secure Channel for this rule.
14. Click on **Save**. Your changes take effect at the next system reboot.
15. (Optional) Click on **Use**. Your changes take effect immediately.

Step 3 - Associate the Remote Host User with the Passport One Profile

1. Select **Configuration** from the Control Panel.
2. Select **Users**. The Users window appears.
3. Click on **Show Editor**. The expanded Users window appears.
4. Click on **Insert**. The list is scrolled to the end. An incomplete new line appears.
5. Type in the new user information on the User Information page.
6. Click on the **Authentication** tab. The Authentication page appears.
7. Select authentication methods in the **Internal Authentication Method** and **External Authentication Method** field.
8. To configure the user to use the Passport One profile configured in Step 2, click on the **Passport One Rules** tab. The Passport One Rules page appears.
9. Select a profile from the **Profile Name** list and type a ***** in the **Source Address** field because the address of the host is unknown and a time period in the **Session Duration** field.
10. Click on **Save**.

See also:

- "Users - Passport One Rules Page" on page II-166
- "Passport One Rules Page" on page II-193
- "Packet-Filtering Rules Window" on page II-22
- "Packet-Filtering Rules Basic Page" on page II-23
- "Packet-Filtering Rules IPSec Page" on page II-29

VPN - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

Configuration files that capture the data entered into the Graphical User Interface are used to produce SPD files for the IPSec Policy Manager. The following files configure IPSec policy:

- VPN Secure Channel Configurations are stored in the **/etc/security/firewall/vpn/channels/** directory. Each channel is identified by a name given by the firewall administrator. File names consist of this name plus a **.conf** file extension.
- IKE Protection Strategies are stored in the **/etc/security/firewall/vpn/ike_strategies/** directory. Each strategy consists of a list of cryptographic properties to negotiate during IKE Phase 1 and is identified by a name given by the firewall administrator. File names consist of this name plus a **.conf** file extension.
- IPSec Protection Strategies are stored in the **/etc/security/firewall/vpn/ipsec_strategies/** directory. Each strategy consists of a list of cryptographic properties to negotiate during IKE Phase 2 and is identified by a name given by the firewall administrator. File names consist of this name plus a **.conf** file extension.
- Trusted CA Certificates are stored in the **/etc/security/firewall/vpn/ca_certs/** directory. CA certificates are stored in individual files, each identified by a name given by the firewall administrator plus a **.cer** extension. The name is used as the key to a CA certificate metadata database that describes the public key certificate.
- Firewall Keypairs are stored under the **/etc/security/firewall/vpn/keypairs/** directory. Each keypair consists of a certificate and private key that is used by the firewall to authenticate itself to any VPN peer during the IKE Phase 1 exchange. Certificates are stored in individual files, each identified by a name given by the firewall administrator plus a **.cer** extension. The corresponding private keys are stored in separate files, each identified by a name given by the firewall administrator plus a **.prv** extension.
- Packet-Filtering Rules are stored in **/etc/security/firewall/ng_inet/netguard.conf** and provide the ipsec option to enable data security on the connection associated with each packet-filtering rule. See “Packet-Filtering Rules Configuration File (netguard.conf)” on page II-43.

IKE Protection Strategy Configuration File (*.conf)

The IKE Protection Strategies window is used to configure and display information for one or more IKE Protection Strategies. This information is stored in a set of text files in the **/etc/security/firewall/vpn/ike_strategies/** directory.

Format guidelines:

- Fields are separated by white space (tabs or spaces)
- Comments begin with the # character and continue until the end of the line
- The first line of the file is always a treated as a comment

Format:

encryption_algorithm authentication_algorithm Diffie-Hellman_group_number SA_lifetime_secs SA_lifetime_kb IP_payload_compression

Fields:

encryption_algorithm — Name of the encryption algorithm. Can be one of the following: **3des-cbc**, **des-cbc**, **twofish-cbc**, **blowfish-cbc**, **aes-cbc**, **cast128-cbc**, or **none**. If **none** is specified, *authentication_algorithm* must not be equal to **none**.

authentication_algorithm — Name of the hash algorithm. Can be one of the following: **sha1**, **md5**, **tiger192**, or **ripemd160**.

Diffie-Hellman_group_number — Can be one of the following: **1**, **2**, or **5**.

SA_lifetime_secs — Lifetime of the SA in seconds. The minimum value is **60**; the maximum value is **315360000** (10 years); the default value is **10800** (3 hours).

SA_lifetime_kb — Lifetime of the SA in kilobytes. The minimum value is **100**; the maximum value is **2147483647**; the default value is **51200** (50 MB). A value of **0** means unspecified, which indicates that this life time type is ignored

The following example shows the layout of the IKE Protection Strategy configuration file.

```
#/etc/security/firewall/vpn/ike_strategies/Strategy1.conf
3des-cbc sha1 2 10800 51200
```

Figure II-108. IKE Protection Strategy Configuration File Example

IPSec Protection Strategy Configuration File (*.conf)

The IPSec Protection Strategies window is used to configure and display information for one or more IPSec Protection Strategies. This information is stored in a set of text files in the **/etc/security/firewall/vpn/ipsec_strategies/** directory.

Format guidelines:

- Fields are separated by white space (tabs or spaces)
- Comments begin with the # character and continue until the end of the line
- The first line of the file is always a treated as a comment

Format:

encryption_algorithm authentication_algorithm SA_lifetime_secs SA_lifetime_kb IP_payload_compression

Fields:

encryption_algorithm	Name of the encryption algorithm. Can be one of the following: **3des-cbc**, **des-cbc**, **twofish-cbc**, **blowfish-cbc**, **aes-cbc**, **cast128-cbc**, or **none**. If **none** is specified, *authentication_algorithm* cannot equal **none**.
authentication_algorithm	Name of HMAC algorithm. Can be one of the following: **hmac-sha1-96**, **hmac-md5-96**, or **none**. If **none** is specified, *encryption_algorithm* cannot equal **none**.
SA_lifetime_secs	Lifetime of the SA in seconds. The minimum value is **60**; the maximum value is **315360000** (10 years); the default value is **28800** (8 hours); a value of **0** means unspecified, which indicates that this life time type is ignored. *SA_lifetime_secs* and *SA_lifetime_kb* cannot both be 0.
SA_lifetime_kb	Lifetime of the SA in kilobytes. The minimum value is **100**; the maximum value is **2147483647**; the default value is **51200** (50 MB); a value of **0** means unspecified, which indicates that this life time type is ignored. *SA_lifetime_secs* and *SA_lifetime_kb* cannot both be 0.
IP_payload_compression	Enables and disables IP Payload compression. Accepted values are: **true**, **false**, **yes**, **no**.

The following example shows the layout of the IPSec Protection Strategy configuration file.

```
#/etc/security/firewall/vpn/ipsec_strategies/Strategy1.conf
3des-cbc hmac-sha1-96 0 51200 NO
```

Figure II-109. IPSec Protection Strategy Configuration File Example

VPN Secure Channel Configuration File (*.conf)

The VPN Secure Channels window is used to configure and display information for one or more VPN Secure Channels. This information is stored in a set of text files in the **/etc/security/firewall/vpn/channels/** directory.

Format guidelines:

- Each statement begins on a separate line, and some may span multiple lines
- Blank lines are permitted
- Comments begin with the # character and continue until the end of the line

Statements:

HOSTNAME=*host_name|IP_address*
IP address or host name that identifies the peer when the peer type is a gateway (**SGW=true**). If a host name is used, it must be defined in the Hosts configuration file.

INTERFACE=*interface*
Device through which VPN client connections are accepted.

SGW=true|false|yes|no
If the peer is a security gateway, this statement is set to true. If the peer is a host, this statement is set to false.

MANUAL_KEYING=true|false|yes|no
If manual keying is used, this statement is set to true. If IKE is used, this statement is set to false.

IKE_PROPOSAL_LIST=*names*
IKE Protection Strategy name.

AGGRESSIVE_MODE=true|false|yes|no
If Aggressive Mode is being used, this statement is set to true. This statement is applicable only to IKE. IKE aggressive mode does not support negotiation of multiple Diffie-Hellman groups; therefore, the Default IKE Strategy will not work with IKE aggressive mode exchanges. Use the preloaded Aggressive strategy or create a new strategy to use with secure channels that specify aggressive mode. IKE aggressive mode does not support negotiation of multiple authentication methods; therefore, secure channels that use aggressive mode should configure either preshared secret or certificates, but not both. IKE Aggressive Mode exchanges through a NAT device using pre-shared keys are not supported. This is true even if NAT-Traversal is enabled. Use RSA or DSA signature authentication (i.e. certificates) for IKE Aggressive Mode exchanges through a NAT device. Use IKE Main Mode for exchanges through a NAT device when using pre-shared keys.

PFS_GROUP=1|2|5
Specifies the group number for perfect Forward Security. 1, 2 or 5. If this keyword is present, PFS will be used. This keyword is applicable only to IKE.

MANUAL_KEYS=*variables*
Variables used to configure manual keys are: inbound SPI, inbound cipher key, inbound authentication key, outbound SPI, outbound cipher key, and outbound authentication key. SPIs must be integers greater than 255. Cipher and authentication keys can be text strings or hexadecimal integers. This keyword is only applicable if manual keying is specified. This field can only be viewed or edited using the GUI.

PRESHARED_SECRET=*secret_string*
Preshared secret can be a text string or a hexadecimal integer. This keyword is applicable only to IKE. This field can only be viewed or edited using the GUI.

USE_SIGNATURES=true|false|yes|no
If certificates will be used for authentication, this statement is set to true and the KEYPAIR variable must have a value. This keyword is applicable only to IKE.

USE_IDENTITY=true|false|yes|no
If the value is set to true, the SPD key structure created for the preshared secret will specify the firewall's IP address as the subject identity to use during IKE Phase 1. The default is **true**.

KEYPAIR=*IKE_keypair_name*
IKE Keypair name.

SUBJECT_NAME=*name*
Subject name presented to the peer during IKE Phase 1.

TRUSTED_CA_CERTS=*IKE_certificate_names*
List of IKE Certificate names separated by colons on the same line or by new lines.

REMOTE_AUTH_IDS=*IDs*
List of authorized identities separated by colons on the same line or by new lines.

NETWORKS=*host_name*|*IP_addr*|*IP_addr_range*|*network_name*|*group_name*|*device*_**NETWORK**
List of host names, IP addresses or an IP address range similar to the IP address ranges accepted by the Grouping window. Items in this list can be separated by colons on the same line or by new lines.

CONNECTION_FLAGS=*non-cfgmode-clients*
VPN clients that are not recognized as supporting XAUTH and IKECFG are allowed to connect without participating in the ISAKMP (IKE) Configuration Method exchanges.

NAT_TRAVERSAL=true|false|yes|no
If yes, the firewall/VPN will participate in NAT discovery and perform NAT Traversal if NAT is discovered. If no, the firewall does not participate in NAT discovery and will not attempt NAT Traversal.

The following example shows the layout of the VPN Secure Channels configuration file.

```
# /etc/security/firewall/vpn/channels/Channel1.conf
SGW=yes
HOSTNAME=10.2.3.4
MANUAL_KEYING=no
AGGRESSIVE_MODE=no
IKE_PROPOSAL_LIST=Default
USE_SIGNATURES=no
USE_IDENTITY=yes
XAUTH=no
NAT_TRAVERSAL=yes
NETWORKS=grp1
         grp2
PRESHARED_SECRET=Ntmt2XWOrUM=
```

Figure II-110. VPN Secure Channels Configuration File Example

VPN Client Configuration File (*.conf)

The **/etc/security/firewall/vpn/ikecfg/***vpn_client_configuration***.conf** file defines the parameters for a VPN client configuration.

Format guidelines:

- Each statement is on a separate line
- Blank lines are permitted
- Comments begin with the # character and continue until the end of the line

Statements:

START_IP_ADDR=*ip_address*
(Optional) Specifies the lowest IP address available in the virtual network.

END_IP_ADDR=*ip_address*
(Optional) Specifies the highest IP address available in the virtual network.

NETMASK=*network_mask*
(Optional) Specifies the network mask of the virtual client network.

DNS=*ip_address*
(Optional) Specifies the IP address of the DNS server that is serving the client in the virtual network.

WINS=*ip_address*
(Optional) Specifies the IP address of the WINS server (NetBios Name Server) that is serving the client in the virtual network.

SUBNETS=*subnetworks/network_masks*
List of networks that the client will need to be configured to use the VPN tunnel to get to them (not supported by the GUI).

USE_SET=true|false
If true, the configuration should be sent by firewall when the firewall determines. If false, the firewall accepts a REQUEST from the client (not supported by the GUI - always true).

XAUTH_IKECFG=true|false
Specifies that the user at the remote VPN client must authenticate (via an XAUTH IKE exchange) with the VPN policy Manager (vpnguard) before the client is allowed to establish VPN tunnels. The user name and password are validated via firewall authentication rules. Additional challenges from the firewall authentication (e.g., password expiration/enter new password) are not supported and are treated as authentication failure. Authentication success/failure is audited to the proxy_ia (network) audit event.

The following example shows the layout of the VPN Client Configuration configuration file.

```
# /etc/security/firewall/vpn/ikecfg/vpnclientconfig1.conf
start_ip_addr=192.168.45.1
end_ip_addr=192.168.241.82
dns_addr=192.168.1.1
set_client_config=true
```

Figure II-111. VPN Client Configuration File Example

LDAP Directories Configuration File (ldap_dirs.conf)

The **/etc/security/firewall/vpn/ldap_dirs.conf** file identifies LDAP servers that can be used to obtain certificates. This file can store ten records.

Format guidelines:

- Comments begin with the # character and continue until the end of the line
- Each LDAP record is listed on a separate line
- Fields are separated by white space (tabs or spaces)

Format:

server [*port*]

Fields:

server Fully qualified domain name or IP address of the LDAP server.

port (Optional) TCP port number of the LDAP server. The default is 389.

The following example shows the layout of the LDAP Directories configuration file.

```
# /etc/security/firewall/vpn/ldap_dirs.conf
ldapserver.cybg.com 389
```

Figure II-112. LDAP Directories Configuration File Example

OCSP Responders Configuration File (ocsp.conf)

The **/etc/security/firewall/vpn/ocsp.conf** file identifies the OCSP responders that the firewall may contact.

Format guidelines:

- Each statement is on a separate line
- Blank lines are permitted
- Comments begin with the # character and continue until the end of the line

Statements:

EnableOcsp = true|false
When set to True, OCSP is enabled; otherwise, OCSP is disabled.

SignOcspRequests = true|false With *keypair_tag*
When set to **True**, OCSP requests are signed using keypair *keypair_tag*. When set to **False**, OCSP requests are not signed.

url CA_tag [**Sign = true|false With** *keypair_tag*] [**RecheckTime** = *seconds*] [**RequireNonce = true|false**] [**UseProducedAt = true|false**]

The words enclosed in square brackets are optional. They cannot be entered using the GUI.

url
Specifies the OCSP responder's access URL. May be set to an asterisk (*) for the default responder.

CA_tag
Specifies a CA certificate. May be set to an asterisk (*) if any CA is accepted.

Sign
(Optional) If **Sign** is set to **true**, OCSP requests for this responder are signed using the specified *keypair_tag*.

RecheckTime
(Optional) Specifies the number of seconds that the OCSP response is to be considered valid after the time the response was issued or produced. This is used to counteract the effect of a difference in the clocks of the firewall and of the OCSP responder.

RequireNonce
(Optional) If **RequireNonce** is **true**, an OCSP response must include a valid nonce in order to be considered valid. This is intended to ensure compatibility with responders that do not include a nonce in their responses.

UseProducedAt
(Optional) If **UseProducedAt** is **true**, then the *producedAt* time in the OCSP response should be used instead of the *thisUpdate* time as the time when the certificate should be considered valid. This is intended to ensure compatibility with responders that do not set the *thisUpdate* time in the response to the current time.

The following example shows the layout of the VPN Secure Channels configuration file.

```
# /etc/security/firewall/vpn/ocsp.conf
EnableOcsp = true
SignOcspRequests = false With ""
"http://valicert.cybg.com:1024/ocsp" "SunONE" RecheckTime = 300 UseProducedAt = true
"http://valicert.cybg.com" "UNICERTIssuer1"
"http://valicert.cybg.com" "UNICERTRoot"
```

Figure II-113. OCSP Responders Configuration File Example

CA Certificate Configuration File (ca_certs.conf)

The **/etc/security/firewall/vpn/ca_certs.conf** file identifies CA tags and CRL files.

Format guidelines:

- Comments begin with the # character and continue until the end of the line
- Each CA certificate record is listed on a separate line
- Fields are separated by white space (tabs or spaces)

Format:

CA_tag CRL_file_name

Fields:

CA_tag	Valid CA tag.
CRL_file_name	Absolute path name of a file containing a CRL. CRL files normally reside in the **/etc/security/firewall/vpn/ca_certs/** directory and have an extension of **.crl**.

The following example shows the layout of the CA Certificate configuration file.

```
# /etc/security/firewall/vpn/ca_certs.conf
UNICERTIssuer1 /etc/security/firewall/vpn/ca_certs/UNICERTIssuer1.crl
UNICERTRoot  /etc/security/firewall/vpn/ca_certs/UNICERTRoot.crl
```

Figure II-114. CA Certificate Configuration File Example

VPN Policy Manager Configuration File (policymgr.conf)

The **/etc/security/firewall/vpn/policymgr.conf** file configures the options associated with VPN controls.

Format guidelines:

- Keywords and variables are separated by white space (tabs or spaces)
- Comments begin with the # character and continue until the end of the line

Statements:

DO_NOT_SEND_CERT_CHAINS=yes|no
Supports an IKE backward-compatibility mode needed for some Alcatel (TimeStep) VPN devices.

NO_CRASH_RECOVERY=yes|no
Crash recovery provides the capability to react to situations where IKE/IPSec Security Associations (SAs) are deleted or missing in the VPN policy manager, yet delete notifications were not sent, or were not received by the VPN peer. **yes** indicates that crash recovery is turned off. **no** indicates that crash recovery is turned on.

CRL_VALIDITY_TIME=*time*
Time period during which a CRL is valid.

MAX_CLIENTS=*number*
Specifies the maximum number of VPN clients that are permitted at one time. The default is 10,000.

RETRY_LIMIT=*number*
Specifies the maximum number of retransmission packets that will be sent. The negotiation is aborted after this limit is reached.

RETRY_TIMER=*seconds*
Specifies the the base interval for the retransmission packets. The first retransmission packet is sent after that time. The next packet is sent at 2^(retransmission packet number) * (**RETRY_TIMER**). For example, if the **RETRY_LIMIT** is 10, the **RETRY_TIMER** is 0.5 (**RETRY_TIMER** is 0 seconds, and **RETRY_TIMER_USEC** is 500000 microseconds), the first retransmission packet is sent out after 0.5 seconds, the second packet after is sent out after 1 second, and following packets after 2, 4, 8, 16, 32, 64, 128, and 256 seconds. After that, the negotiation times out.

RETRY_TIMER_USEC=*microseconds*
Specifies the the base interval for the retransmission packets.

RETRY_TIMER_MAX=*seconds*
Specifies the maximum time in seconds between retrasmission packets. For example if the RETRY_TIMER_MAX is set to 30 seconds, the **Initial retry interval** is set to 0.5 seconds, and the **Maximum number of retries** is set to 10, the retransmission packets are sent after 0.5, 1, 2, 4, 8, 16, 30, 30, 30, and 30 seconds.

EXPIRE_TIMER=*seconds*
Specifies maximum time for the whole negotiation. After this time expires, the negotiation is immediately aborted.

The following example shows the layout of the VPN policy manager configuration file.

```
#/etc/security/firewall/vpn/policymgr.conf
DO_NOT_SEND_CERT_CHAINS=no
NO_CRASH_RECOVERY=no
CRL_VALIDITY_TIME=86400
MAX_CLIENTS=10000
RETRY_LIMIT= 6
RETRY_TIMER=3
RETRY_TIMER_USEC=500000
RETRY_TIMER_MAX=10
EXPIRE_TIMER=40
```

Figure II-115. VPN Policy Manager Configuration File Example

CRL Files (*.crl)

Each CA Certificate in the IKE Certificate Management window can be assigned an optional CRL file. This CRL is stored in the **/etc/security/firewall/vpn/ca_certs/** directory. Each certificate file in this directory is named with a **.crl** extension.

CA Certificate Files (*.cer)

The CA Certificates page of the IKE Certificate Management window displays information for one or more CA Certificates. This information is stored in a set of certificate files in the **/etc/security/firewall/vpn/ca_certs/** directory. Each certificate file in this directory is named with a **.cer** extension. For example, a certificate **thawte-ca** will have a corresponding file named **thawte-ca.cer**.

Firewall Keypair Files (*.cer and *.prv)

The Keypairs page of the IKE Certificate Management window displays information for one or more keypairs. A *keypair* is the pairing of a certificate with a private key. This information is stored in certificate and private key files in the **/etc/security/firewall/vpn/keypairs/** directory. Certificate files in this directory are named with a **.cer** extension; while private key files are named with a **.prv** extension.

VPN Control Command (vpnctl)

The **vpnguard(1M)** daemon (**/usr/sbin/firewall/vpnguard**) is invoked by **netguard(1M)** and functions as the IPSec Policy Manager, IKE service, and IPSec Certificate manager. The **/usr/sbin/firewall/vpnctl** command can also be used to control **vpnguard(1M)**.

Syntax:

```
vpnctl config [-v]
vpnctl delete-sas [-v]
vpnctl stop [-v]
vpnctl ike-log [-l level] [-f logfile] [-x max_size] [-Vcv]
vpnctl events [-l level] [-v]
vpnctl trace [-l level] [-f logfile] [-x max_size] [-vc]
vpnctl ike-log|events|trace [-qv]
```

Options and arguments:

config Signals **vpnguard(1M)** to re-read its SPD configuration.

delete-sas Causes **vpnguard(1M)** to delete all active IPSec and IKE Security Associations (SAs). Delete notifications are sent to VPN peers.

stop Signals **vpnguard(1M)** to terminate/exit.

ike-log Starts and stops IKE exchange debug logging. The default log file is **/var/adm/log/ike.log**.

events Sets the lowest priority **syslog** priority level message to be sent by the policy manager (**vpnguard(1M)**). The **-l** *level* specified along with all higher (lower numbered) priorities are enabled and will be sent to **syslog**. Note that the final **syslog** destination depends on the syslog configuration. See **syslog.conf(4)**.

trace If trace logging is enabled (**-l** *level* option is non-zero), all event (syslog) messages are sent to the trace file. The default trace file is **/var/tmp/vpn.log**.

-l *level* Sets the debug level. Stops logging if the level is 0.

The following are the acceptable levels listed from highest to lowest priority.

EMERG	0	system is unusable
ALERT	1	action must be taken immediately
CRIT	2	critical conditions
ERR	3	error conditions
WARNING	4	warning conditions
NOTICE	5	normal but significant condition
INFO	6	informational messages
DEBUG	7	debug-level messages

-f *logfile* Writes to the specified file.

-x *max_size* Sets the maximum size in Kilobytes that the log file is allowed to grow before logging is disabled. The default is 4096 KB (4 MB).

-c Clears the log file.

-V Produces a more formatted output to the IKE log. This format is easier to read and output records span multiple lines.

-v Verbose output. Displays **vpnguard(1M)** control connection status.

-q Queries the current settings. The -v option can be used to produce an easily readable table of the current settings; otherwise a one-line output is produced in the following format:

log:*file*:*level*:*flags*:*max*:*size*:*lines*[:*msg*] where:

log - Log name (IKE, EVENTS, or TRACE)

file - Log file name (NA for EVENTS)
level - Logging level (non-zero if logging is on)
flags - VERBOSE and/or FULL
max - Maximum log file size in Kilobytes
size - Current log file size in bytes
lines - Number of lines in the log file
msg - Optional message

VPN Report Command (vpnrpt)

Use **/usr/sbin/firewall/vpnrpt** command to generate system information related to VPN activity, including statistics and routing. Virtual routing tables are the defined VPN Secure Channel peer-protected networks. You can type the following commands on the command line or use the System Information Window to view formatted reports. See "System Information Window" on page I-246.

Syntax:

```
/sbin/tfadmin vpnrpt stats -ipsec [-dv]
/sbin/tfadmin vpnrpt stats -ike [-dv]
/sbin/tfadmin vpnrpt stats -global [-v]
/sbin/tfadmin vroute [-pcv]
/sbin/tfadmin ike-log [-v]
```

Options and arguments:

stats	Displays VPN statistics.
-ipsec	Displays VPN IPSec SA statistics.
-ike	Displays VPN IKE SA statistics.
-global	Displays global IPSec statistics.
-d	Provides detailed SA statistics.
-g	Provides general statistics.
-v	Verbose output.
vroute	Displays VPN virtual network routing.
ike-log	Displays the IKE exchange debug log.
-p	By default, the network routing table is ordered by network address. This option orders the table by peer GW address.
-c	By default, the network routing table is ordered by network address. This option orders the table by channel name.

Troubleshooting VPN

Tools for Troubleshooting VPN

Use the following tips to help troubleshoot your VPN configuration.

- To remove all old SAs and start fresh, delete all SAs via the VPN Controls window. Or run the following command:

  ```
  vpnctl delete-sas
  ```

  If this does not achieve the desired effect, run the following commands:

  ```
  vpnctl stop
  netguard
  ```

- Look in **/var/adm/syslog** and **/var/adm/log/osmlog** for vpnguard messages. To view the vpnguard messages on the Console Messages window, select **Reports** on the Control Panel, and then select **Console Messages** on the Reports menu.
- To view IKE and IPSEC SA statistics, see the System Information window and the Activity Reports window. See also the vpnrpt(1M) system manual page.
- To view static rules and active netguard sessions, run the following command:

  ```
  netguard -ln
  ```

  Note the **ipsec_src**, **ipsec_dst**, and **ipsec_nat** flags designate IPSEC options enabled on a rule.
- Review "Troubleshooting Network or Interface Problems" on page I-92.

Troubleshooting Aids

- Turn on IKE Exchange Logging in the VPN Controls window and make sure that the **Produce verbose output** check box is checked.
- When using Certificates, turn on VPN Certificate Alerts and Activities.
- When using third-party products like OCSP responders, HTTP servers, FTP servers and/or LDAP servers, be sure to review their accompanying documentation to find out what error-reporting facilities they provide. They may provide information that will assist in troubleshooting VPN connections.

IKE Exchange Log Error messages

This section lists some error messages and their interpretation:

Malformed payload

If preshared secrets are being used, this error message indicates that the preshared secret was incorrectly typed.

Proposal not chosen

This error message occurs for a variety of reasons.

First, make sure that the following match for both VPN gateways:

- IKE Protection Strategy
- IPSec Protection Strategy
- VPN Secure Channel (IKE)
    - o IKE Mode
    - o Perfect Forward Secrecy Group
- VPN Secure Channel (Manual Keying)
    - o Inbound and Outbound SPIs
    - o Cipher Key and Authentication Keys

If certificates are being used, make sure that both VPN gateways are using the same public key algorithm in the certificates.

Examine the packet filtering rules on both VPN gateways and ensure that the rules contain the same source and destination addresses in order for the IKE Phase 2 Identities to match.

Check if the VPN Secure Channels window contains any Remote Identities. If certificates are being used, check whether the Subject Name in the local VPN gateway's certificate matches with the Remote Identity in the remote VPN gateway's VPN Secure Channels window.

Some VPN clients require a simple VPN policy. When troubleshooting it is useful to use a simple IKE Protection Strategy and IPSec Protection Strategy consisting only of one cryptographic property each.

Some VPN clients require the firewall to send its IP address as its IKE Phase 1 Identity when using preshared secrets. When troubleshooting preshared secrets, ensure that the **Use Identity** check box in the IKE Advanced Settings dialog box of the VPN Secure Channels window is checked.

Authentication failed

This error message may indicate that there was a problem related to certificates. Turn on VPN Certificate Alerts and Activities to get information on certificate-related problems.

Some Alcatel/TimeStep VPN devices require the **Do not send certificate chains** check box in the VPN Controls window to be checked.

VPN with Certificates

This section lists some things that should be checked if VPN with Certificates is not working:

System date/time

Before proceeding, check the Date and Time window and set the correct date and time if necessary.

Root and Intermediate CA Certificates

As much as possible, all CA certificates needed to trace the certification path of both the firewall's certificate and the peer VPN gateway's certificate must be imported into the Certificate Management window. At a bare minimum, the root CA certificate must be present and one or more LDAP servers should be defined in the IKE Certificate Services window so that the firewall can query them, if necessary, for the intermediate CA certificates.

Troubleshooting OCSP

This section lists some things that should be checked if OCSP is not working:

1. Make sure that the system dates/times of the firewall and the OCSP responder are in sync.
2. The OCSP responder certificate must not be self-signed.
3. If the status of certificate *x* is to be checked, make sure that the issuer of *x* directly issued the OCSP responder's certificate.
4. While testing, turn off **Certificate Revocation Checking** by setting it to **Disabled** to prevent any interactions with CRLs. Also delete all LDAP Servers.
5. Make sure that the CRLs in the LDAP server and the OCSP server are in sync (i.e., that the CRLs are not old).

PKI/Certificate-related IKE Exchange Log error messages

This section lists some error messages and their interpretation. These error messages occur in both the IKE Exchange Log and in the VPN Certificate Alerts and Activities.

Certificate was revoked
The firewall encountered a revoked certificate in its certificate processing.

Certificate was not found
The firewall tried to retrieve a certificate from a LDAP, HTTP or FTP server but failed.

Certificate chain did not reach trusted root CA
The firewall was unable to verify whether a certificate was trusted.

CRL was too old
Check system date/time.of the firewall and of the certification authority server.

Have the certification authority operator publish new CRLs to the LDAP server and retry troubleshooting.

CRL was not found
The firewall tried to retrieve a certificate from a LDAP, HTTP or FTP server but failed.

CRL update time is in the future
Check system date/time.of the firewall and of the certification authority server.

Have the certification authority operator publish new CRLs to the LDAP server and retry troubleshooting.

Time information was not available
Check system date/time of the firewall.

The firewall may have attempted an operation that took too long and affected the timing of the certificate processing.

Check whether HTTP, FTP and LDAP connections are succeeding. The firewall starts HTTP, FTP or LDAP connections to retrieve CRLs and it starts HTTP connections to OCSP responders. Verify that these connections are not timing out. View the certificates by clicking on the View button in the Certificate Management window. Check whether the certificates contain any unresolved host names and insert the host names into the Host Names window.

Database search timeout or Database search failed
The firewall tried to retrieve a certificate from a LDAP, HTTP or FTP server but failed.

Path was not verified
The firewall was unable to verify whether a certificate was trusted.

PKI/Certificate-related IKE Exchange Log error messages for OCSP

This section lists some error messages and their interpretation. These error messages occur in both the IKE Exchange Log and in the VPN Certificate Alerts and Activities.

No responses were found
The firewall was not able to validate any responses from the OCSP responder.

A nonce is required or
The nonce did not match or
The serial number did not match or
The issuer key hash did not match or
The timestamps that were indicated in the response were bad or
The signature of the OCSP response was not verified
The firewall detected a problem in the OCSP response.

The responder is not authorized to sign responses or
The responder search failed
The firewall detected a problem in the OCSP responder's certificate.

Make sure that the OCSP responder certificate was issued by one of the CAs in the Certificate Management window.

Failed to receive an OCSP response
The firewall was not able to validate any responses from the OCSP responder.

Chapter 14
Alerts, Activities, and Archives

Monitoring firewall activity is important so that you can detect and respond to threats and critical conditions. You can configure the firewall to recognize suspicious and critical events and customize your response to these events. You can log regular firewall activities to special files, which you can copy to another directory, or you can log firewall activities to the syslog so the files can be sent to a remote host or used for Centralized Auditing. The Centralized Auditing System reads syslogd messages and can print graphs and tables about the data collected.

Firewall activity can also be archived to a tape device, file system on the firewall, or an FTP server. These archives can be encrypted.

WebTrends™ is a third-party product from WebTrends Corporation. Used in conjunction with the CyberGuard Firewall, WebTrends offers a variety of configurable reports that provide extensive information about firewall activity. Configurable reports that contain information about firewall activity in real time can be configured on the Activities Page of the Alerts, Activities, and Archives Window (see page II-341); audit reports containing session information can be generated through the WebTrends Audit Reports Window (see page I-276). For complete details about configuring WebTrends and its reports, see *WebTrends for Firewalls and VPNs*, provided by WebTrends Corporation.

Activity logs can be moved from one directory to another to prevent the files from growing until the disk becomes full. These files can also be processed by CSMART (Centralized Solution for Monitoring, Auditing, Reporting, and Tracking) to generate easy-to-read reports.

Alerts, Activities, and Archives Window

Use this window to view a list of suspicious event types (occurrences that may require attention) and their alert settings, enable or disable alerts, change the alert parameters; and enable or disable logging for activity types (non-threatening occurrences). Use the Alert Summary window to monitor alerts and the Activity Reports window to view alerts and activities log files.

CAUTION!

Logging activity information and logging and mailing alert information can fill your disk. You can enable an alert for the **Disk partitions full** event to forewarn that a specified file system is about to be filled.

For frequently occurring suspicious event types, some alerts can make the situation worse. For example, enabling the Window alert might tie up the Alert Summary window, and logging disk-full messages to a file might consume even more disk space.

The Alerts, Activities, and Archives window consists of three notebook pages: Alerts, Activities, and Archives.

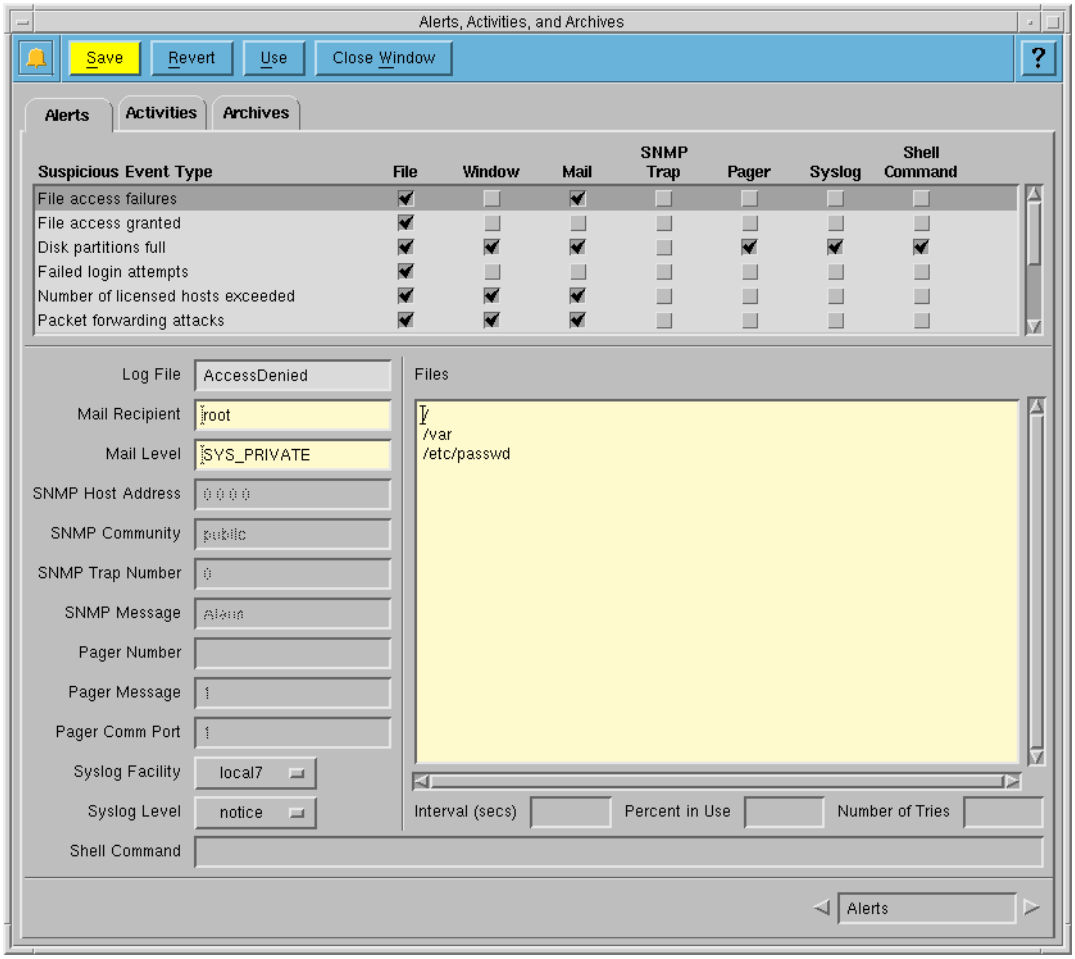


Figure II-116. Alerts, Activities, and Archives Window - Alerts Page

Note: Auditing is turned on at boot time. Use the **auditoff(1M)** command to turn auditing off and use the **auditon(1M)** command to restart auditing. Use the **auditlog(1M)** command to view the current status of auditing.

See also:

- **auditon(1M)** system manual page
- **auditoff(1M)** system manual page
- **auditlog(1M)** system manual page
- *System Administration* UnixWare online manual
- “Alert Summary Window” on page I-250
- “Activity Reports Window” on page I-252
- “How to Enable and Disable Alerts” on page II-352
- “How to Log Alerts and Activities for WebTrends Reports” on page II-354
- “Activity Logs Window” on page II-360
- “Secure Remote Management Window” on page I-157

Alerts Page

Use this page of the Alerts, Activities, and Archives window to view a list of suspicious event types (occurrences that may require attention) and their alert settings, enable or disable alerts for suspicious event types, and change the alert parameters; this permits anticipating potential system abuses and automating responses to them. Use the Alert Summary and Activity Reports windows to monitor alerts.

This page contains the following fields and alarm controls:

Suspicious Event Type
Lists each suspicious event or attack type. See "Suspicious Event Types" on page II-331.

File Logs suspicious-event records to a trusted file. A default file in the **/var/audit_logs/** directory exists for each suspicious event type. If **Window** is checked or the file exists, you can view this file in the Activity Reports window. Use the Activity Logs window to back up these files.

Window Writes the count of each suspicious event type to the Alert Summary window; the counter increments each time the corresponding suspicious event type occurs. Disabling this option removes the suspicious event type from list in the report window. Check this option only when you think that the frequency of suspicious events will not overwhelm the X server.

Mail Electronically mails the alert message. The user must already exist on the internal mail host at **NETWORK** level or on the firewall. Undeliverable mail goes to the **root** user.

SNMP Trap Sends an enterprise-specific SNMP trap for each alert message to an SNMP community that includes the destination SNMP host. (See the **estrap(1M)** system manual pages, SNMP documentation for foreign host types, the **/etc/netmgt/snmpd.comm** file, and the *Network Administration* UnixWare online manual.)

Pager Sends a numeric message to a pager telephone number.

Syslog Writes suspicious-event records to the system log file specified in the **/etc/syslog.conf** file. The default file is **/var/adm/syslog**. (See the **syslog(3G)**, **logger(1)**, and **syslogd(1M)** system manual pages.)

Shell Command Runs a trusted program or script. The standard input to the command is the text of the audit-log entry associated with this alert.

The following fields affect alert behavior:

Log File (Read-only) Name of the default audit-log file for this suspicious event type. The file is in the trusted **/var/audit_logs/** directory.

Mail Recipient (Required with Mail alert) Existing login ID either on the internal mail host or on the firewall. The syntax is: *user*[**@***mailhost*]. The default is root, the system administrator on the firewall. See also "Packet-Filtering Rules for Alerts" on page II-340.

Mail Level (Required with Mail alert) Transmission level for the mail. This level is a level at which the recipient is cleared to read mail. The default is **NETWORK**. Use **NETWORK** when sending mail to a user on an internal mail host.

SNMP Host Address (Required with SNMP Trap alert) Address of the host receiving the SNMP trap. The default is 0.0.0.0, indicating that the trap is broadcast to any SNMP host listening for traps sent to the specified community. See also "Packet-Filtering Rules for Alerts" on page II-340.

SNMP Community (Required with SNMP Trap alert) Community to receive the SNMP trap. The default is public.

SNMP Trap Number (Required with SNMP Trap alert) Integer that identifies this SNMP trap. The default is 0. (Avoid using 1, 2, or 3 because the SNMP product uses them.)

SNMP Message (Required with SNMP Trap alert) Prefix of text sent as part of the SNMP trap. The text of the audit-log entry associated with this alert is appended to this field.

Pager Number (Required with Pager alert) Telephone number of the pager including optional access code. Each comma (**,**) represents a two-second delay. The # character is also permitted in this field. See also "Pager Numbers" on page II-339.

Pager Message (Required with Pager alert) Numeric message to display on the pager. The default is 1*1 where the first 1 identifies a specific firewall, ***** is a separator that appears as a **-**, and the second 1 means urgent. The # character is also permitted in this field.

Pager Comm Port (Required with Pager alert) Serial communications port number of the tty connected to the outgoing modem for the pager. Possible values include 1, 2, 3, and 4.

Syslog Facility (Required with Syslog alert) System component generating the problem message. The default is local7. See **syslogd(1M)** and **syslog.conf(4)** system manual pages.

Syslog Level (Required with Syslog alert) Problem severity. The default is notice message priority.

Shell Command (Required with Shell Command alert) Program or script name, commands, options, arguments, redirection, etc. for execution by the Bourne shell. Single quotation marks replace double quotation marks. The alert message is available on standard input.

Files (Required with **File access failures**, **File access granted**, and **Disk partitions full** suspicious event types) Trusted files and directories to monitor. The characters ***** and **?** are treated as literals, not as wild cards.

Interval (secs) (Required with **Disk partitions full**, **Failed login attempts**, and **Attempts to scan network ports** suspicious event types) Maximum number of seconds that is deemed significant between occurrences.

Percent in Use (Required with **Disk partitions full** suspicious event type) Maximum percentage of file system in use that is deemed significant.

Number of Tries (Required with **Failed login attempts** and **Attempts to scan network ports** suspicious event types) Minimum number of attempts that are deemed significant over an **Interval**.

Notes:

- By default, notification about suspicious events occurs at least every five minutes. To decrease this interval, do one of the following:
  - Invoke **auditlogd** with the **-i** *sec* option in the Shell window
  - Keep the System Statistics window open (minimized or not)
  - Click on **Refresh Now** in the System Statistics window
  - Set the **Refresh Interval** field to something less than 300 seconds, and click on **Use New Interval** in the System Statistics window
- Three features allow you to write information to the syslog: the Syslog fields on the Alerts page, the Syslog Setup frame on the Activities page, and the WebTrends Setup frame on the Activities page. If you specify a facility and level for one feature, all other features that use the same facility and level will use the same log location. You can specify the log location on the Syslog Setup frame and the WebTrends Setup frame, but not on the Alerts page.
- SNMP trap, syslog, and mail to a host other than the firewall require that specific additional services run on the system. By default, the **syslog** service is adequately configured, but the others are not.
- Remember that pager transmissions over the airways and e-mail and SNMP messages over the Internet can be intercepted.

See also:

- “Alert Summary Window” on page I-250
- “Activity Reports Window” on page I-252
- “System Statistics Window” on page I-285
- “Files to Monitor for Suspicious Events” on page II-335
- “Pager Numbers” on page II-339
- “Packet-Filtering Rules for Alerts” on page II-340
- “How to Enable and Disable Alerts” on page II-352
- “Activity Logs Window” on page II-360

Suspicious Event Types

The following list contains a brief description of all suspicious event (attack) types and the messages generated when their associated alerts are checked.

File access failures
Unsuccessful attempts to access specified trusted files or directories.

File access granted
Successful attempts to access specified trusted files or directories.

Disk partitions full
Disks are reaching capacity within a specified interval. Only partition names, such as /, **/var**, and **/usr**, are useful with this suspicious event. See "Controlling the Size of Disk Partitions" on page II-336.

Failed login attempts
Unsuccessful attempts to login to the firewall by the same user or through the same terminal (tty) device within a specified interval. Users can be blacklisted and prohibited from logging on to the firewall after a specified number of attempts. See "Security Options - User Blacklisting Page" on page II-231.

Number of licensed hosts exceeded
Denied TCP connections because the number of internal hosts permitted to pass packets through the firewall reached the licensed limit. Be sure to enable this alert if your company does not have unlimited user licenses. See "License Keys Window" on page I-61.

Packet forwarding attacks
Attempts to forward inbound packets through a different route than usual.

Land attacks
Discarded packets in which the source address and port are the same as the destination address and port. Land is a widely available attack tool that exploits the vulnerability of many TCP/IP implementations to these particular packets.

Ping of death attacks
Discarded packets, often from a **ping(1)** command, that contain an illegal combination of IP fragment offset and IP length and might cause the destination host to crash if allowed to pass through.

TCP SYN flood attacks
Within a specified time interval, a specified number of TCP connections failed due to a timed out SYN/ACK segment sent from the same server IP address and port number.

IP interface spoofing attempts
Attempts to confuse the firewall with spurious packets. For example, a packet with a source address of an internal interface that is received on an external interface.

Interface access check failures
Access to an interface was denied due to a MAC failure.

Network port scan attempts
Attempts to exploit the firewall through the ports it listens on.

File transmission blocked
The content scanning software has identified a dangerous or undesirable file or document and blocked its transmission through the firewall. Note that alerts are not generated for disinfected files.

High availability served transition
A transition has been made to or from the “served” (active) or “unknown” state.

High availability missing heartbeat
Heartbeat messages are absent from the served or standby firewall. Total or partial failure are noted in the report.

Software update
Automatic updates to the firewall or operating system software through use of the Software Updates window.

Platform sensor events
Provides information about sensor events, such as the status of temperature, fans, and voltages in the system. Also provides alert notification when the UPS battery is low or when the UPS transitions from line power to battery or from battery to line power.

Audit archiving activity
Identifies successful archiving as well as problems such as the capacity overriding “keep days”, high utilization of local destinations, FTP failures, and tar failures.

Intrusion Detection shutdown message
Working with NetProwler, provides notification when a packet-filtering rule is added by the Intrusion Detection System to deny traffic an offending connections.

VPN IKE alert
Indicates an issue has occurred with IKE.

VPN IPSec alert
Indicates an issue has occurred with IPSec.

VPN Interceptor alert
Indicates an issue has occurred with an ESP or AH session.

VPN X9.17 random number failure
Indicates the VPN pseudo random number generator has generated the same number twice. The FIPS 140-1 standard requires that VPN operation be halted in this unlikely event. Therefore, the operator must investigate and resolve the problem and then manually resume VPN operation.

VPN Certificate alert
Provides information about problems with certificates.

HA standby down
Indicates that the standby machine in a High Availability pair is down. This alert is generated on the served machine.

CM/HA standby disk full
Indicates that the disk on the standby machine has reached capacity. This alert is generated on the served machine.

Auditing disabled
Indicates that auditing has been disabled. The administrator may choose to shutdown the firewall, receive a page, and receive e-mail when this alert occurs. To enable these actions, type the following command in the **Shell Command** field:

`/usr/sbin/auditoff_alert -s 10 -p` *`phone_number`* **`-m 1*911 -c`** *`com_port`* **`-r cgadmin`**

where **`-s`** is the number of seconds before the firewall shuts down, **`-p`** is the phone number of the pager, **`-m`** is the message displayed on the pager, **`-c`** is the com port of the pager, and **`-r`** is the user ID to which e-mail is sent at NETWORK level.

Note that every night at midnight, the auditing subsystem switches to the audit file for the next day and turns auditing off for a moment. This generates an **auditoff** event followed immediately by an **auditon** event. Because this is a normal event, the **auditoff_alert** command can be used to take action only when auditing is disabled unexpectedly.**See also:**

- “Packet-Filtering Rules Window” on page II-22
- “Static Routes Page” on page II-83
- “Packet-Filtering Rules for Alerts” on page II-340
- “Content Scanning with CVP” on page III-18
- “FTP CVP Page” on page III-29
- “HTTP CVP Page” on page III-85
- “SMTP CVP Page” on page III-207
- Software Update Window

Default Log Files for Suspicious Event Types

The following table presents the default files from the **/var/audit_logs/** directory for the suspicious event types monitored by the firewall.

Table II-5. Default Log Files for Suspicious Event Types

Suspicious Event Type	Default Log File: /var/audit_logs/
File access failures	AccessDenied
File access granted	AccessGranted
Disk partitions full	DiskFull
Failed login attempts	LoginFailed
Number of licensed hosts exceeded	HostsLimit
Packet forwarding attacks	ForwardD
Land attacks	LandAttack
Ping of death attacks	PingDeath
TCP SYN flood attacks	SynFlood

Table II-5. Default Log Files for Suspicious Event Types (Cont.)

Suspicious Event Type	Default Log File: /var/audit_logs/
IP interface spoofing attempts	NetguardI
Interface access check failures	IFMACerror
Network port scan attempts	PortScan
File transmission blocked	BlockedFile
High availability served transition	HAtransition
High availability missing heartbeat	HAnohb
Software update	SWUpdate
Platform sensor events	PlatformSensor
Audit archiving activity	AuditArchive
Intrusion Detection shutdown message	IDSMsg
VPN IKE alert	VPNIkeAlert
VPN IPSec alert	VPNIPSecAlert
VPN Interceptor alert	VPNIntcpAlert
VPN X9.17 random number failure	VPNX917TEST
VPN Certificate alert	VPNCertAlert
HA standby down	HAStandbyDown
CM/HA standby disk full	HAStandbyAlert
Auditing disabled	AuditOff

See also “Alert Summary (Suspicious-Event) Reports” on page I-254.

Files to Monitor for Suspicious Events

The following list contains all file and directory names that the GUI alters during firewall configuration. After you check any alert for **File access failures** or **File access granted** suspicious events, you may wish to type some of these names in the **Files** field.

- **/etc/TIMEZONE**
- **/etc/confnet.d/inet/interface**
- **/etc/inet/hosts**
- **/etc/inet/inetd.conf**
- **/etc/inet/networks**
- **/etc/inet/services**
- **/etc/netconfig**
- **/etc/nodename**
- **/etc/passwd**
- **/etc/resolv.conf**
- **/etc/security/cyber/alert.conf**
- **/etc/security/cyber/trace.conf**
- **/etc/security/firewall/gated.conf**
- **/etc/security/firewall/if.conf**
- **/etc/security/firewall/nat.*.conf**
- **/etc/security/firewall/netguard.conf**
- **/etc/security/firewall/proxies/*-proxy.conf**
- **/etc/security/firewall/proxies/DNS/EXTERNAL/***
- **/etc/security/firewall/proxies/DNS/INTERNAL/***
- **/etc/security/firewall/proxies/aliases**
- **/etc/security/firewall/proxies/builtin/***
- **/etc/security/firewall/proxies/encoding***
- **/etc/security/firewall/proxies/sockd.conf**
- **/etc/security/firewall/proxies/sockd.route**
- **/etc/security/firewall/routes.conf**
- **/etc/security/firewall/startup.conf**
- **/etc/security/ia/ageduid**
- **/etc/security/ia/audit**
- **/etc/security/ia/index**
- **/etc/security/ia/level**
- **/etc/security/ia/master**
- **/etc/security/tfm/roles**
- **/etc/security/tfm/users**
- **/etc/shadow**

Controlling the Size of Disk Partitions

When a disk partition, such as **/var**, reaches a specified percentage of its capacity, the firewall shuts down to protect itself and its internal hosts. As the default location for audit-logs files, the **/var** partition is particularly susceptible to becoming full. You can manually monitor and control the size of a partition, or you can configure a controlled system response to prevent a partition from reaching its capacity and unexpectedly shutting down the firewall.

Note: The instructions and examples in this section refer to the **/var** partition, although they can apply to any partition.

To manually monitor and control the size of the /var partition:

1. Use the **df -v** command to regularly monitor the **/var** partition.
2. Backup important files.
3. Remove old files from the **/var/audit** directory.

To automatically monitor and control the size of the /var partition:

1. Select **Configuration** from the Control Panel.
2. Select **Alerts, Activities, and Archives**.
3. Select **Disk partitions full**.
4. Type **/var** in the **Files** field.
5. Type a percentage value (85% to 90%) in the **Percent in Use** field.
6. Configure the firewall to notify the FSO or others:
   a. Check desired alert options, such as **Mail** or **Pager**.
   b. Complete the corresponding alert data fields.
7. Configure one of the following automatic responses. Configuration steps are described below.

   - Turn auditing off when the partition reaches its specified capacity.
   - Shut down the system when the partition reaches its specified capacity. The FSO must reboot the firewall and then backup or delete files from the affected partition.
   - Run a shell script when the partition reaches its specified capacity. Use a script similar to the following example to backup and delete audit-logs files automatically.

To turn auditing off when the partition reaches its specified capacity:

1. Check **Shell Command**.
2. Type **/usr/sbin/auditoff** in the **Shell Command** field.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. Click on **Use**. Your changes take effect immediately.

To turn auditing back on:

1. Open a shell window. See "Shell Window" on page I-310.
2. Type **/usr/sbin/auditon**.
3. Type **/usr/sbin/audit_init_log**.

To shut down the system when the partition reaches its specified capacity:

1. Check **Shell Command**.
2. Type **/usr/sbin/init 0** in the **Shell Command** field.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. Click on **Use**. Your changes take effect immediately.

To run a shell script when the partition reaches its specified capacity:

1. Check **Shell Command**.
2. Type the name of your script in the **Shell Command** field.
3. Click on **Save**. Your changes take effect at the next system reboot.
4. Click on **Use**. Your changes take effect immediately.

You can configure the script shown below to perform one of the following tasks:

- Backup the oldest audit-logs files and remove them
- Copy the oldest audit-logs files to another partition and remove them
- Remove the oldest audit-logs files

```
#!/usr/bin/sh
cmd='basename $0'
USAGE() {
        cat <<END_OF_USAGE
$cmd [ count ]

 Backup and delete the <count> oldest audit log files.
 count - The number of audit log files to be backed up and deleted.
         When count is not specified a default of 1 is used.
END_OF_USAGE
}

d=`date`
DIR=/var/audit
# Default backup device.
DEV=/dev/rmt/ntape1
# set number of files to backup/delete <cnt>.
if [ $# -eq 0 ]; then
   cnt=1
else
   cnt=$1
fi

list=""
oldest='/bin/ls -1t $DIR | egrep [0-9]{7}.Z | tail -$cnt'

for file in 'echo $oldest'; do
    list="$list $DIR/$file"
done

# Select one of following actions by removing ###.
#
# 1. Backup the oldest audit trail file(s) and remove them.
#    NOTE: Verify that <DEV> is set to the correct device.
###/usr/bin/tar -cf $DEV $list && /bin/rm $list
###echo "$cmd:$d: File(s) $oldest backed up and removed." >> $DIR/BackupLog
#
# 2. Copy the oldest audit trail files to a different partition and
#    remove them. NOTE: <BACKUP_DIR> must be set.
###/usr/bin/find $list | cpio -pLuvdm $BACKUP_DIR && /usr/bin/rm $list
###echo "$cmd:$d: File(s) $oldest copied to $BACKUP_DIR and removed." >> $DIR/BackupLog
#
# 3. Remove the oldest audit trail files.
###/usr/bin/rm $list
###echo "$cmd:$d: File(s) $oldest removed." >> $DIR/BackupLog
```

Figure II-117. Script Example for Handling Disk Partitions Full Event

If a full **/var** partition shuts down the firewall, restore the system with the following steps:

1. Boot to **mUNIX**, following the procedure in "Maintenance Kernel (mUNIX)" on page I-321.
2. Backup any important files.
3. Remove as many old files from the **/var/audit/** directory as possible.
4. Run the **df -v** command to view the remaining space in the **/var** partition. Continue removing files until adequate space is available.
5. Reboot the firewall with the **init 6** command.
6. Login to the CyberGuard Firewall.

See also:

- **auditon(1M)** system manual page
- **auditoff(1M)** system manual page
- **init(1M)** system manual page
- "Shell Window" on page I-310

Pager Numbers

Use the **Pager Number** field to specify the telephone number and dialing delays for a paging service.

Syntax:

[*access_code*,[...]]*telephone_number*,,[...]

Arguments:

[ ]	(*For illustration only*) encloses optional parameters
...	(*For illustration only*) repeats the preceding parameter
access_code	Digits needed to access an outside line
,	Two-second delay
telephone_number	Telephone number of the pager

For example, type **9,,5551234,,,,** to specify the access code for an outside line (9), a four-second pause for a slow modem (,,), the pager number (5551234), and eight-second pause to allow the service to pick up before data transmission (,,,,).

To test your pager number:

1. Enable the **Pager** alert for the **File access granted** suspicious event type.
2. Type **/etc/passwd** in the **Files** field.
3. Type in the **Pager Number**, erring on the side of too long pauses.
4. Type a message of up to 10 digits in the **Pager Message** field.
5. Type in the **Pager Comm Port** field.
6. Click on **Use**. Your changes take effect immediately.
7. Trigger a **File access granted** suspicious event by entering the following command:

   ```
   wc -l /etc/passwd
   ```

8. Repeat steps 3 and 6 until the message is received successfully.
9. (Optional) Disable this **Pager** alert.

Packet-Filtering Rules for Alerts

The GUI automatically adds packet-filtering rules to the Packet-Filtering Rules window if they are not already present and if SNMP trap alerts are enabled. Packet-filtering rules for mail alerts require some manual intervention.

- If SNMP traps are enabled, the GUI adds packet-filtering rules.
  - If the default SNMP host address (`0.0.0.0`) is used, the following packet-filtering rules are added:

    ```
    # SNMP Alarm Trap rules (added automatically by the CyberGuard GUI)
    permit   snmp-trap/udp   FIREWALL   EVERYONE
    # End of SNMP Alarm Trap rules
    ```

  - If an SNMP host address other than the default is used, the following packet-filtering rules are added:

    ```
    # SNMP Alarm Trap rules (added automatically by the CyberGuard GUI)
    permit   snmp-trap/udp   FIREWALL   SNMP_host_address
    # End of SNMP Alarm Trap rules
    ```

- For mail alerts to go to a user on an internal mail host, do the following:
  - In the Shell window, edit the **/usr/ucblib/sendmail.cf** file, and change the `mailhost` string to the name of your mail host.
  - In the Packet-Filtering Rules window, ensure that the following rule exists:

    ```
    permit   smtp/tcp   FIREWALL   mailhost
    ```

See also “Packet-Filtering Rules Window” on page II-22.

Activities Page

Use this page of the Alerts, Activities, and Archives window to enable or disable logging for activity types (non-threatening occurrences); this provides easy access to logically related auditing information. Use the Activity Reports window to monitor activities.

Note: The following screen capture is an example of the Activities page of the Alerts, Activities, and Archives window and not necessarily a proper or complete configuration or the configuration that is appropriate to your company's needs. The Syslog Setup, the WebTrends Setup, and the Centralized Auditing Setup are enabled so that all fields are clearly visible. This may not be desirable for your firewall setup.

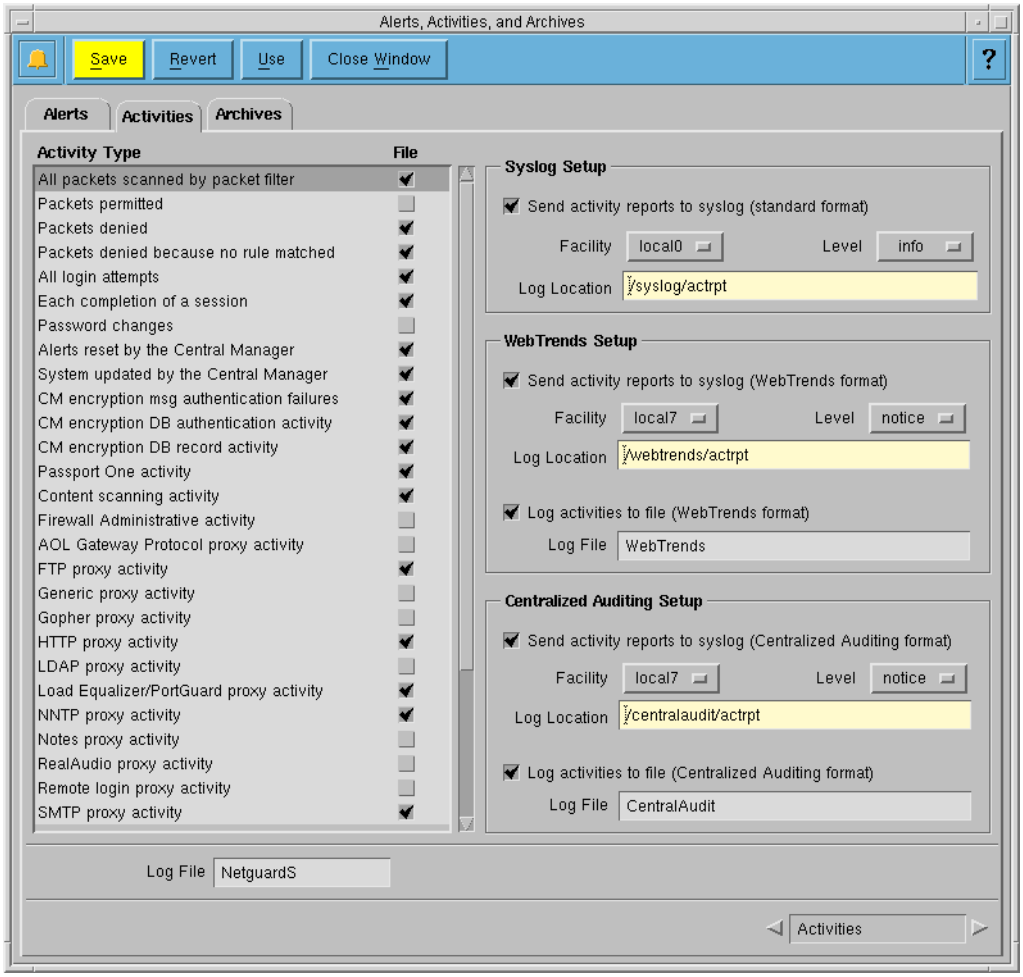


Figure II-118. Alerts, Activities, and Archives Window - Activities Page

This page contains the following fields and controls:

Activity Type Lists each activity type.
File Logs activity records to a trusted file.

Log File (Read-only) Name of the default audit-log file for this activity type. The file is in the trusted **/var/audit_logs/** directory. Use the Activity Logs window to back up these files.

Note: By default, logging of activities occurs at least every five minutes. To decrease this interval, in the System Statistics window, either click on **Refresh Now** or set the **Refresh Interval** field to something less than 300 seconds, or in the Shell window, invoke **auditlogd** with the **-i** *sec* option.

Syslog Setup

This Syslog Setup frame allows you to write records to a remote host or a local file. Syslog writes the facility, level, and destination in **/etc/syslog.conf** file and, if necessary, establishes a packet-filtering rule for access to the remote host.

Send activity reports to syslog (standard format)

Writes activity records to the system log file specified in the **Log Location** field. For additional information about syslog, see the **syslog(3G)**, **logger(1)**, **syslog.conf(4)**, and **syslogd(1M)** system manual pages.

Facility

System component generating the problem message. The default is **local0**.

Level

Problem severity. The default is **info** message priority.

Log Location

Directory and file location in which to write the activity records. This location can be on a local or remote host.

WebTrends Setup

The WebTrends Setup frame allows you to write records to the syslog or to a local log file in WebTrends format. Syslog writes the facility, level, and destination in **/etc/syslog.conf** file and, if necessary, establishes a packet-filtering rule for access to the remote host. For further information about WebTrends, see the introduction to this chapter on page II-325, "WebTrends Audit Reports Window" on page I-276, and *WebTrends for Firewalls and VPNs*, provided by WebTrends Corporation.

Send activity reports to syslog (WebTrends format)

Writes activity records to the system log file in the WELF format used by the WebTrends software.

Facility

System component generating the problem message. The default is **local7**.

Level

Problem severity. The default is **notice** message priority.

Log Location

Directory and file location in which to write the activity records. This location can be on a local or remote host.

Log activities to file (WebTrends format)

Writes activity records to the file specified in the **Log File** field in the format used by the WebTrends software.

Log File
(Read-only) Name of the default audit-log file in which to write the activity records. The file is in the trusted **/var/audit_logs/** directory. Use the Activity Logs window to back up these files.

Centralized Auditing Setup
The Centralized Auditing Setup frame allows you to write records to the syslog or to a local log file in Centralized Auditing format. Syslog writes the facility, level, and destination in **/etc/syslog.conf** file and, if necessary, establishes a packet-filtering rule for access to the remote host. For further information about Centralized Auditing see the introduction to this chapter on page II-325 and "How to Log Alerts and Activities for Central Auditing" on page II-355.

Send activity reports to syslog (Centralized Auditing format)
Writes activity records to the system log file in the Centralized Auditing format used by the Centralized Auditing software.

Facility
System component generating the problem message. The default is **local7**.

Level
Problem severity. The default is **notice** message priority.

Log Location
Directory and file location in which to write the activity records. This location can be on a local or remote host. A remote host must be a host name defined using the Hosts window or an IP address. A local log file must be a fully qualified path name.

Log activities to file (Centralized Auditing format)
Writes activity records to the file specified in the **Log File** field.

Log File
(Read-only) Name of the default audit-log file **(CentralAudit)** in which to write the activity records. The file is in the trusted **/var/audit_logs/** directory. Use the Activity Logs window to back up these files.

Notes:

- Do not to send WebTrends data to syslog at the same facility and level or to the same local log file as non-WebTrends data.
- Four features allow you to write information to the syslog: the Syslog fields on the Alerts page, the Syslog Setup frame on the Activities page, the WebTrends Setup frame on the Activities page, and the Centralized Auditing Setup frame on the Activities page. If you specify a facility and level for one feature, all other features that use the same facility and level will use the same log location. You can specify the log location on the Syslog Setup frame and the WebTrends Setup frame, but not on the Alerts page.

See also:

- "Activity Reports Window" on page I-252
- "Activity Reports" on page I-258
- "System Statistics Window" on page I-285
- "Activity Logs Window" on page II-360

Activity Types

The following list contains a brief description of all activity types and the information that is logged when their associated **File** check box is checked in the Activities page of the Alerts, Activities, and Archives window.

All packets scanned by packet filter
Packets compared against packet-filtering rules.

Packets permitted
Packets permitted by the firewall. If **File** is checked and **Use** is clicked, **Service Connections** on the System Statistics window get updated.

Packets denied
Packets denied by the firewall.

Packets denied because no rule matched
Packets does not match any rules and is, therefore, denied.

All login attempts
Attempts to login or logout.

Each completion of a session
Termination of a TCP connection.

Password changes
Changes to password or the **passwd** file.

Alerts reset by the Central Manager
Alerts on a Target Firewall that have been reset by the Firewall Manager.

System updated by the Central Manager
Configuration propagation sent from the Firewall Manager to a Target Firewall.

CM encryption msg authentication failures
The integrity of the encrypted configuration data transmitted from the Firewall Manager to a Target Firewall is in question because an authentication check failure was detected on an encrypted packet sent from the Firewall Manager to a Target Firewall.

CM encryption DB authentication activity
Successful or unsuccessful login to the cryptographic keys database or successful or unsuccessful changes to the password for the cryptographic keys database.

CM encryption DB record activity
Changes (additions, modifications, deletions) to the encryption keys database.

Passport One activity
Attempts to use Passport One or NT Authentication Detection for inbound and outbound connections.

Content scanning activity
CVP virus scanning and ActiveX, Java, JavaScript, and VBScript language blocking.

Firewall Administrative activity
GUI actions including: starting the GUI, stopping the GUI, changing configuration files, executing commands, signalling daemons, changing GUI roles, blacklisting users, and unblacklisting users. This log also includes proxy user administration records.

SSH activity
Connection attempts and activities using the Secure Shell.

proxy_name **proxy activity**
Connections, legal, and illegal use of proxy commands, where *proxy_name* is FTP, Generic (Proxy-Writer), Gopher, HTTP, LDAP, Load Equalizer/Port Guard, NNTP, Notes, RealAudio, Remote Login, SMTP, SQL*Net, SOCKS, SSL, Telnet Login, X11, X11 Hook, X11 display daemon. Note that the Load Equalizer and the Port Guard SmartProxies share the same audit-log file.

VPN IKE activity
Activities associated with IKE.

VPN IPSec activity
Activities associated with IPSec.

VPN Interceptor activity
Activities associated with ESP or AH sessions.

VPN Certificate activity
Provides information about VPN certificate activity.

See also:

- "System Statistics Window" on page I-285
- "Packet-Filtering Rules Window" on page II-22
- "Users Window" on page II-153
- "Central Management" on page I-103
- "SmartProxies Window" on page III-5
- "SOCKS Window" on page II-213

Default Log Files for Activity Types

The following table presents the default files from the **/var/audit_logs/** directory for the activity types monitored by the firewall.

Table II-6. Default Log Files for Activity Types

Activity Type	Default Log File: /var/audit_logs/
All packets scanned by packet filter	NetguardS
Packets permitted	NetguardP
Packets denied	NetguardD
Packets denied because no rule matched	NetguardM
All login attempts	Logins
Each completion of a session	NetguardT
Password changes	Passwd
Alerts reset by the Central Manager	CMReset
System updated by the Central Manager	CMPropagate
CM encryption msg authentication failures	CMAuthFail
CM encryption DB authentication activity	CMDbAuth
CM encryption DB record activity	CMDbRecords
Passport One activity (also records NTAD activity)	PassportOne
Content scanning activity	ContentScan
Firewall Administrative activity	FWAdmin
FTP proxy activity	ProxyFTP
Generic proxy activity (Proxy-Writer)	ProxyGeneric
Gopher proxy activity	ProxyGopher
HTTP proxy activity	ProxyHTTP
LDAP proxy activity	ProxyLDAP
Load Equalizer/Port Guard proxy activity	ProxyLDE
NNTP proxy activity	ProxyNNTP
Notes proxy activity	ProxyNotes
Rlogin proxy activity	ProxyRlogin
SMTP proxy activity	ProxySMTP
SQL*Net proxy activity	ProxySQLNet
SOCKS proxy activity	SOCKS
SSH activity	SSH

Table II-6. Default Log Files for Activity Types (Cont.)

Activity Type	Default Log File: /var/audit_logs/
SSL proxy activity	ProxySSL
Telnet login proxy activity	ProxyTelnet
X11 (direct) proxy activity	ProxyX11
X11 (virtual) proxy activity	ProxyX11Hook
X11 display daemon activity	ProxyX11Disp
VPN IKE activity	VPNIkeActivity
VPN IPSec activity	VPNIPSecActivity
VPN Interceptor activity	VPNIntcpActivity
VPN Certificate activity	VPNCertActivity

See also “Activity Reports” on page I-258.

Archives Page

Use this page of the Alerts, Activities, and Archives window to periodically archive log files to a tape device, one or more file systems on the firewall, or one or more FTP destination addresses. Archiving to a file system can be configured to work in conjunction with FTP archiving for the concurrent log processing/movement on a high performance system such as STARLord. The log file archive can also be encrypted.

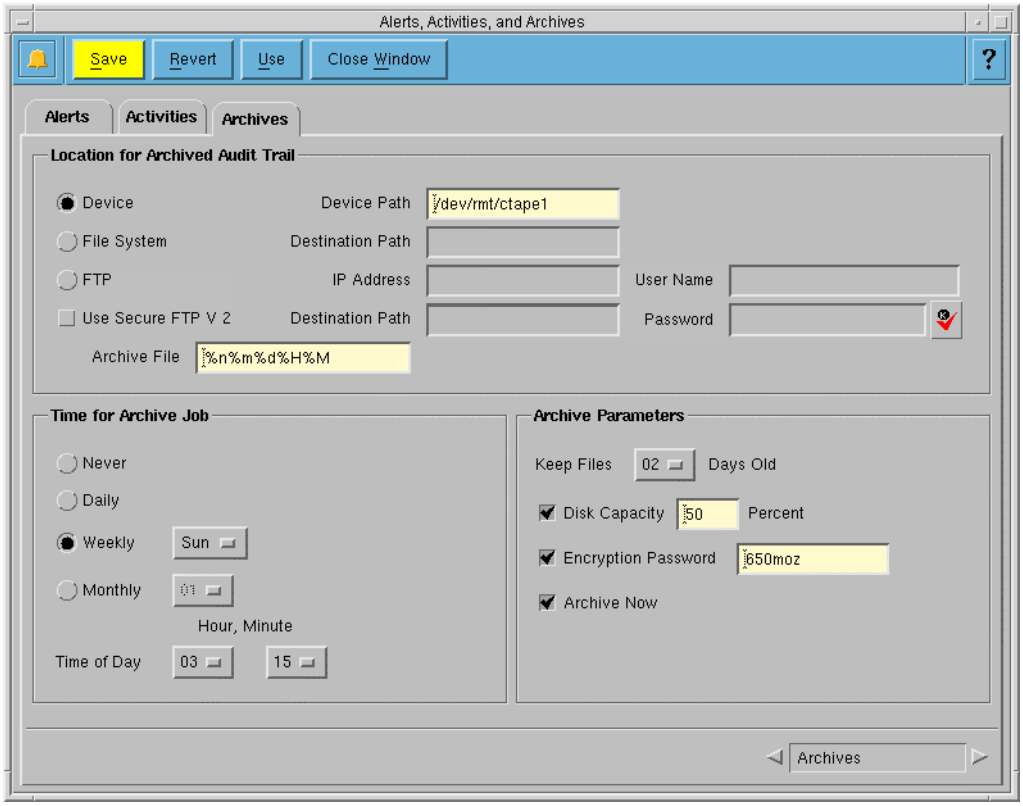


Figure II-119. Alerts, Activities, and Archives Window - Archives Page

This page contains the following fields and controls:

Location for Archived Audit Trail

Indicates the method to be used for storing the audit logs. Can be a tape device, a file system on the firewall, or an FTP log server.

Device — Stores audit logs to tape. Note that this option is not supported in KnightSTAR units; a tape device is not available with those units.

Device Path — (Required with **Device**) Full path name of the tape device on which logs are to be archived.

File System — Stores audit logs to one or more file systems on the firewall. On the local system, the audit archives will fill the first directory in the **Destination Path** list until the file system on which it resides reaches a disk capacity of 75%. At that point, the audit

archive system determines if there is another destination directory in the **Destination Path** on another file system for which the utilization is less. **File System** archiving can be configured to work with **FTP** archiving to provide the concurrent log processing/movement on a high performance system such as STARLord. See **Using File System Archiving with FTP Archiving** below.

Destination Path (Required with **File System**) Full path name of the directory or directories on the firewall to which logs are to be archived. Directories must be separated with a semicolon and should be on different file systems. The **/archive** file system is the recommended storage location for appliance firewalls KnightSTAR, STARLord, and FireSTAR, and was created for this purpose. A standard UnixWare firewall does not have the **/archive** file system; it is recommended to FTP the files to another machine.

FTP Sends audit logs from the firewall to a log server using FTP. **File System** archiving can be configured to work with **FTP** archiving to provide the concurrent log processing/movement on a high performance system such as STARLord. See **Using File System Archiving with FTP Archiving** below.

Use Secure FTP V2 Sends audit logs from the firewall to a log server using Secure FTP (SFTP) Version 2. SFTP is similar to FTP but uses SSL to encrypt and decrypt the packets. The Secure Shell Server version 2 must be used. Note that Secure FTP allows the user name to be part of the command line, assumes all transfers are binary, and does not prompt the user for multiple file transfers.

IP Address (Required with **FTP**) Host name or IP address of FTP server on which to archive logs.

Destination Path Full path name of one or more directories on the FTP server to which logs are to be archived. Directories must be separated with a semicolon. The directories must exist, and the user specified by User Name must be able to write to it. The default destination path is the user's home directory.

User Name (Required with **FTP**) Login name on the FTP server.

Password (Required with **FTP**) Password for user on the FTP server. Single or double quotes, leading #, and backslash in the password are not permitted. A confirmation icon appears to the right of this field. A red check mark indicates that the password has not been confirmed. Click on the button, and a popup window with a confirmation field appears. A yellow icon indicates that the password is the process of being confirmed. If the value entered in the confirmation popup matches the **Password** value, the icon turns green, indicating that the password has been confirmed.

Archive File Name under which the file will be archived. Directory and file names are preprocessed by the **date(1)** command to replace date and time specifiers (e.g., **%M**). In addition, **%f** is replaced by the simple source file name or some predefined string (**cf** for the

active configuration, **cgrv** for the archive directory, **arc** for anything else) and **%n** is replaced by the node name. **%t**, which the **date** command would replace with a tab, is replaced by an underscore. The default file name for items that need a file name is **%f.%n.%y%m%d%H%M**, which expands to something like `cf.gonzales.0006191304`. Two symbols help distinguish members of an HA pair: **%a** is replaced by the machine alias (cg1 vs. cg2) and **%i** is replaced by the machine hardware ID (as found in the License Keys window).

Time for Archive Job

Indicates how often the audit logs are to be archived.

Never — Indicates that no archiving is scheduled.

Daily — Indicates that audit logs are to be archived once each day. If this button is selected, you must specify values in the **Time of Day** lists.

Weekly — Indicates that audit logs are to be archived once each week. If this button is selected, you must choose a day of the week from the associated drop-down list. You must also specify values in the **Time of Day** lists.

Monthly — Indicates that audit logs are to be archived once each month. If this button is selected, you must choose the desired day of the month from the associated drop-down list. You must also specify values in the **Time of Day** lists.

Time of Day — Specifies the time at which audit logs are to be archived. Set the time by choosing a value ranging from 00 to 23 in the **Hour** drop-down list and a value ranging from 00 to 59 in the **Minute** drop-down list.

Keep Files — Specifies the number of days' audit logs that are to be kept on the firewall instead of being archived. Choose a value ranging from 01 to 31 in the associated drop-down list. The default is 01, which specifies that audit logs older than one day will be archived.

Disk Capacity — Archives audit logs when the disk capacity reaches a specified threshold. Disk capacity is checked every hour on the hour and each day at midnight when the system checks if it should archive on that day. If this box is checked, enter a number ranging from 1 to 100 in the **Percent** field. The default value is 70.

The **Disk Capacity** field overrides the **Keep Files** field. This is to accommodate systems that generate a great number of audit records each day. If the utilization of the **/var** file system goes above the capacity setting, the audit archive system attempts to archive enough of the audit records currently in **/var**, to reduce the utilization of that file system to below the required capacity. This archival starts with the oldest audit records, and leaves only the most recent record in **/var**. This single file is the file that is currently collecting audit records.

Use caution when setting the **Disk Capacity**. If it is set too low, audit archive will archive records every hour, and still may not be able to satisfy the capacity requirement. If it is set too high, **/var** could fill up completely, resulting in firewall shutdown. It is recommended that Disk Capacity be set between 50% and 80%, depending upon how full **/var** is without any audit records.

Encryption Password

Indicates whether the log file archive is to be encrypted prior to sending it to the specified device, file system, or FTP server. If this box is checked, you must enter a password to encrypt the archive. This value is a string of characters including any printable character (lower and upper case letters, punctuation marks, and numbers). It is used to generate a cryptographic key for encrypting the archive.

Archive Now

Indicates whether the audit logs are to be archived immediately. If this box is checked, information entered on the window is applied, and archiving is performed.

Notes:

- The name of a log file archive has the following format:

  hostmmddhhmm.**tar**

  where *mm* represents the month, *dd* the day, *hh* the hour, and *mm* the minute.

  (e.g., cgfw03282330.tar)

  The name of an encrypted log file archive has the following format:

  hostmmddhhmm.**tar.encr**

  (e.g., cgfw03282330.tar.encr)

- The archiving facility creates a log file on the firewall called **/tmp/auditarc.err**. This file contains information about the last time audit archive was called. It tells how many files are being archived, the spaced used by those files, and whether or not there is space in a destination directory to hold the archive. If there is sufficient space to archive it elsewhere, the file also holds the name and location of the archive, whether or not the archive was encrypted, was created successfully, etc. It tells whether or not a local destination has reached its specified disk capacity. If so, and an FTP server is configured, it holds information about which files were transferred or problems encountered using FTP. This file is overwritten each time audit archiving is run.

- An archive alert, **Audit archiving activity**, can be configured to notify the administrator about archival problems such as capacity overriding "keep days", high utilization of local destinations, FTP failures, and tar failures. You can also establish an alert for disk space usage, **Disk partitions full**, for all file systems used by the audit archive system.

- To restore archived logs, see "How to Restore Archived Logs" on page II-357.

Using File System Archiving with FTP Archiving:

The FTP archiving feature can be configured to automatically archive and move audit data when the system switches file systems to recommence audit log creation. To do this, complete the following steps:

1. Specify a file system use threshold in the **Disk Capacity** field. When this threshold is met, audit logs will be placed in another file system.
2. Select FTP and fill in the **IP Address**, **Destination Path**, **User Name**, and **Password** fields.
3. Click on the **Save** button.
4. Select **File System** and fill in the **Destination Path** field.
5. Click on the **Save** button.

See also:

- "Activity Reports Window" on page I-252
- "Activity Reports" on page I-258
- "System Statistics Window" on page I-285
- "Activity Logs Window" on page II-360

How to Enable and Disable Alerts

You can use the Alerts page of the Alerts, Activities, and Archives window to specify which events may require attention and to choose how to automatically detect and respond to these occurrences.

CAUTION!

For frequently occurring suspicious event types, some alerts can make the situation worse. For example, enabling the Window alert might tie up the Alert Summary window, and logging disk-full messages to a file might consume even more disk space.

To display the Alerts page of the Alerts, Activities, and Archives window:

1. Select **Configuration** from the Control Panel.
2. Select **Alerts, Activities, and Archives**. The Alerts page of the Alerts, Activities, and Archives window appears.

To enable or disable alerts:

1. To detect when a disk-full problem is about to occur, ensure that the **File** alert for **Disk partitions full** is checked.
2. (Optional) Check other alert options. Some fields may become required for some newly enabled alerts and some suspicious event types.
3. Click on **Save**. Your changes are saved in the alert configuration file **/etc/security/cyber/alert.conf**. The changes take effect at the next system reboot. If you checked an SNMP Trap alert, **Save** adds packet-filtering rules for each unique address in the Packet-Filtering Rules window; it also deletes rules for each obsolete address.
4. (Optional) Click on **Use**. Your changes take effect immediately; the alerts that you enabled will be triggered if and when they occur. If you checked a Window alert, **Use** adds a line to the Alert Summary window.

To display an alert file:

1. Select **Report** from the Control Panel.
2. Select **Alert Summary**. The Alert Summary window appears.
3. Select a suspicious event type. Its alert file appears.

See also:

- “Packet-Filtering Rules Window” on page II-22
- “Alert Summary Window” on page I-250

How to Enable and Disable Activities

You may want to have easy access to logically related auditing information about non-threatening events. You can use the Activities page of the Alerts, Activities, and Archives window to specify which events to log.

To display the Activities page of the Alerts, Activities, and Archives window:

1. Select **Configuration** from the Control Panel.
2. Select **Alerts, Activities, and Archives**. The Alerts, Activities, and Archives window appears.
3. Click on the **Activities** tab. The Activities page appears.

To enable or disable activity logging:

1. Check the **File** check box for activity types that you want to log.
2. Click on **Save**. The changes take effect at the next system reboot.
3. (Optional) Click on **Use**. Your changes take effect immediately.

To display an activity file:

1. Select **Report** from the Control Panel.
2. Select **Activity Reports**. The Activity Reports window appears.
3. Select an activity report. Its activity file appears.

See also "Activity Reports Window" on page I-252.

How to Log Alerts and Activities for WebTrends Reports

You can write certain alert and activity records in WebTrends format to the syslog or to a file. You can view these reports by transferring the files to a computer running the WebTrends reporting tool.

To display the Activities page of the Alerts, Activities, and Archives window:

1. Select **Configuration** from the Control Panel.
2. Select **Alerts, Activities, and Archives**. The Alerts, Activities, and Archives window appears.
3. Click on the **Activities** tab. The Activities page appears.

To configure alerts and activities for WebTrends logging:

1. To write activity records to the system log file, click on **Send activity reports to syslog (WebTrends format)**, select a **Facility**, and select a **Level**.
2. To write activity records to a log file in WebTrends format, click on **Log activities to a file (WebTrends format)**. The default location of the log file is **/var/audit_logs/WebTrends**.
3. Click on the **Alerts** page and enable the events you would like to log in WebTrends format. The following alerts are available: Disk partitions full, Failed login attempts, File access granted, Packet forwarding attacks, Number of licensed hosts exceeded, Land attacks, Ping of death attacks, TCP SYN flood attacks, Interface access check failures, Access to an interface was denied due to a MAC failure, and Network port scan attempts.

To View a WebTrends log using WebTrends software:

1. Transfer the log files to a computer running Windows and WebTrends using **ftp**, **tar**, or **doscp**, depending on your company's security policy.
2. Use the WebTrends tool as specified in the *WebTrends for Firewalls and VPNs* manual, provided by WebTrends Corporation.

See also:

- "Activity Reports Window" on page I-252
- "Alerts Page" on page II-328
- "Activities Page" on page II-341

How to Log Alerts and Activities for Central Auditing

You can write alert and activity records to the syslog or to a file for use in centralized auditing. You must determine which activities you want to include and where you want to log them.

To display the Activities page of the Alerts, Activities, and Archives window:

1. Select **Configuration** from the Control Panel.
2. Select **Alerts, Activities, and Archives**. The Alerts, Activities, and Archives window appears.
3. Click on the **Activities** tab. The Activities page appears.

To configure alerts and activities for Central Auditing:

1. To log activity records to the system log file for local or remote logging, click on **Send activity reports to syslog (Centralized Auditing format)**, select a **Facility** and **Level**, and type the name of a log file or a remote host in the **Log Location** field.
2. To log activity records in the local **/var/audit_logs/CentralAudit** log file, click on **Log activities to a file (Centralized Auditing format)**.
3. Click on **Save**. The changes take effect at the next system reboot.
4. (Optional) Click on **Use**. Your changes take effect immediately.

See also:

- “Activity Reports Window” on page I-252
- “Alerts Page” on page II-328
- “Activities Page” on page II-341

How to Archive Alert and Activity Logs

The CyberGuard Firewall accommodates centralized log storage. You can periodically archive log files to a variety of locations: a tape device, a file system on the firewall, or an FTP system.

To display the Archives page of the Alerts, Activities, and Archives window:

1. Select **Configuration** from the Control Panel.
2. Select **Alerts, Activities, and Archives**. The Alerts, Activities, and Archives window appears.
3. Click on the **Archives** tab. The Archives page appears.

To configure archiving:

1. Select a method for storing data (**Device**, **File System**, or **FTP**) and complete the required fields for that type.
2. Select **None**, **Daily**, **Weekly**, or **Monthly** to set the frequency of the archive procedure. For weekly and monthly archives, select the day of the week or number of months from the associated drop-down lists
3. Select the **Time of Day** for the archive to take place.
4. Specify the number of days audit logs are to be kept on the firewall with the **Keep Files** drop-down list.
5. To archive audit logs when disk capacity reaches a specified threshold, check the **Disk Capacity** box and type a percentage into the corresponding field.
6. To encrypt the archive before sending it to the device, check the **Encrypt Password** box. Type a password into the corresponding field.
7. To archive the audit logs immediately, check the **Archive Now** box.

See also:

- “Activity Reports Window” on page I-252
- “Alerts Page” on page II-328
- “Activities Page” on page II-341

How to Restore Archived Logs

The sections that follow explain how to restore log files that have been archived to a log server, tape, or file system.

Note: The **cg_crypt(1M)** utility uses a statically-linked SSL library that is not shipped with the CyberGuard Firewall product. Therefore, this library is not available for inclusion with or access by other applications.

Files Archived to Log Server

To be able to generate an audit logs report from a binary audit log file archive that has been stored on an FTP server, you must transfer the archive to the firewall, decrypt it if applicable, and extract the files from the archive.

Prior to transferring the archive to the firewall, you must add a packet-filtering rule on the Packet-Filtering Rules window on the firewall. To display this window, select Configuration from the firewall Control Panel, and then select Packet-Filtering Rules. Specify the following rule to permit an FTP transfer from the log server to the firewall:

`permit  ftp/tcp  log_server  FIREWALL`

(Click on the **?** button or press <F1> to display help related to this window.)

To transfer an archive to the firewall, decrypt it, and extract the files, complete the following steps on the firewall:

1. Select **Tools** from the Control Panel.
2. Select **Shell** Window.
3. When the Shell Window is displayed, enter the following to become root (note that **su** cannot be executed from any level other than SYS_PRIVATE):

   /sbin/tfadmin newlvl SYS_PRIVATE
   su

   Enter the corresponding password, and press <Enter>
4. Enter the following to change level to network:

   newlvl network
5. Enter the following commands to create and change to an appropriate directory on the firewall and to use FTP to retrieve the archive from the log server.

   cd /archive
   mkdir *audit_dir*
   cd *audit_dir*
   ftp *log_server*
   User: *log_server_login_ID*
   Password: *log_server_password*

cd *log_server_archive_directory*
bin
get *archive_name*
(e.g., **get cgfw03282330.tar** or **get cgfw03282330.tar.encr**)
quit

6. If you encrypted the log file archive, enter the following command to decrypt it:

   cg_crypt -d -p *encryption_password* **-i** *archive_name*

   The name of the decrypted file is of the form *host_namemmddhhmm***.tar** if a file of that name does not already exist; otherwise, it is of the form *host_namemmddhhmm***.tar.decr**.

7. Enter the following command to extract all audit logs files from the retrieved archive. Note that files will be restored to **/archive/audit_dir**.

   tar xvf *archive_name*
   (e.g., **tar xvf cgfw03282330.tar** or **tar xvf cgfw03282330.tar.decr**)

8. Enter **exit** to exit the root shell.

9. Enter **exit** to return to the previous level.

10. Enter **exit** to close the Shell Window.

Instructions for producing an audit logs report from the binary audit logs files are presented in "How to Generate an Audit-Logs Report" on page I-275. Note that in the **Audit log directory** field, you must change the name to **/archive/audit_dir**.

Files Archived to Tape

Note: This option is not supported in KnightSTAR units. A tape device is not available with a KnightSTAR unit.

To be able to generate an audit logs report from a binary audit log file archive that has been stored to tape, you must restore the archive from tape, decrypt it if applicable, and extract the files from the restored archive.

To obtain an archive from tape, decrypt it, and extract the files, complete the following steps:

1. Enter the following commands to create and change to a directory for the archived files:

   cd /archive
   mkdir *audit_dir*
   cd *audit_dir*

2. Enter the following command to retrieve the archive file from the tape:

   tar xvf *device_name*

3. If you encrypted the log file archive, enter the following command to decrypt it:

   cg_crypt -d -p *encryption_password* **-i** *archive_name*

The name of the decrypted file is of the form *host_namemmddhhmm*.**tar** if a file of that name does not already exist; otherwise, it is of the form *host_namemmddhhmm*.**tar.decr**.

4. Enter the following command to extract all audit logs files from the archive:

   tar xvf *archive_name*

   (e.g., **tar xvf cgfw03282330.tar** or **tar xvf cgfw03282330.tar.decr**)

Instructions for producing an audit logs report from the binary audit logs files are presented in "How to Generate an Audit-Logs Report" on page I-275. Note that in the **Audit log directory** field, you must change the name to **/archive/audit_dir**.

Files Archived to File System

To be able to generate an audit logs report from a binary audit log file archive that has been stored on the **/archive** file system, you must decrypt it if applicable and extract the files from the archive.

To decrypt the archive and extract the files, complete the following steps:

1. Enter the following commands to create and change to a directory for the archived files:

   cd /archive
   mkdir *audit_dir*
   cd *audit_dir*

2. If you encrypted the log file archive, enter the following command to decrypt it:

   cg_crypt -d -p *encryption_password* **-i** *archive_name*

   The name of the decrypted file is of the form *host_namemmddhhmm*.**tar** if a file of that name does not already exist; otherwise, it is of the form *host_namemmddhhmm*.**tar.decr**.

3. Enter the following command to extract all audit logs files from the archive:

   tar xvf *archive_name*

   (e.g., **tar xvf cgfw03282330.tar** or **tar xvf cgfw03282330.tar.decr**)

Instructions for producing an audit logs report from the binary audit logs files are presented in "How to Generate an Audit-Logs Report" on page I-275. Note that in the **Audit log directory** field, you must change the name to **/archive/audit_dir**.

See also:

- "Activity Reports Window" on page I-252
- "Alerts Page" on page II-328
- "Activities Page" on page II-341

Activity Logs Window

Use this window to transfer activity-log files daily from one directory to another and to specify whether network names or IP addresses will be used in the reports. Moving and resetting the activity-log files prevents the files from growing until the disk becomes full. The default is to grow the files. Activity-log files in **/var/audit_logs/** are archived in **/var/audit_logs/old/**.

You can also use this window to send activity-log files to the CSMART (Centralized Solution for Monitoring, Auditing, Reporting, and Tracking) server to generate easy-to-read reports.

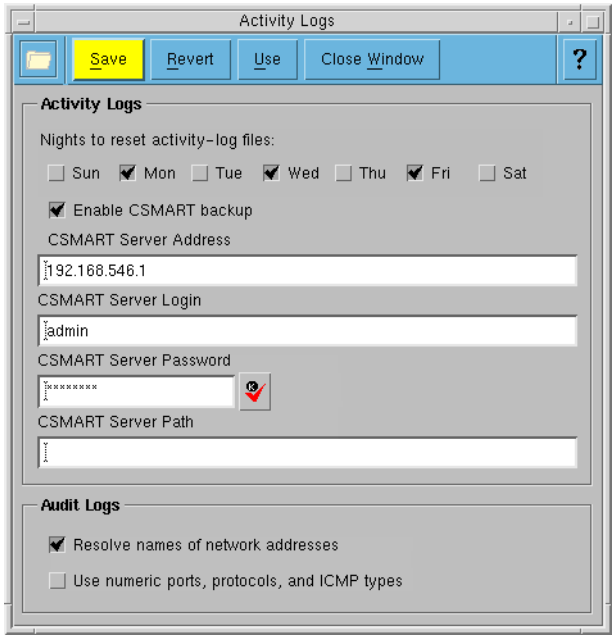


Figure II-120. Activity Logs Window

This window contains the following controls:

Nights to reset activity-log files
Moves activity-log files at 12:15 a.m. on the days checked from one directory to another, overwriting files in the destination directory.

Enable CSMART backup
Enables the backup of the activity reports to the server specified in the **CSMART Server Address** field. This will occur just after midnight on weekdays if **Reset activity-log files weekday nights** is specified or just after midnight on weekends if **Reset activity-log files weekend nights** is specified or both if both are specified.

CSMART Server Address
The name or IP address of the CSMART server. The activity reports will be sent via FTP to this address whenever they are backed up.

CSMART Server Login
The login ID on the CSMART server.

CSMART Server Password
The password for the specified login ID on the CSMART server. A confirmation icon appears to the right of this field. A red check mark indicates that the password has not been confirmed. Click on the button, and a popup window with a confirmation field appears. A yellow icon indicates that the password is the process of being confirmed. If the value entered in the confirmation popup matches the **CSMART Server Password** value, the icon turns green, indicating that the password has been confirmed.

Confirm Password
Confirmation of the password specified in the CSMART server password.

CSMART Server Path
The directory name on the CSMART server. Special characters are recognized:

%i - Hardware ID of the firewall
%n - Node name of the firewall
%a - Alias (in an HA pair) of the firewall (e.g., cg1 vs. cg2) all of the special characters recognized by the date command.

Resolve names of network addresses
Creates reports showing host and domain names rather than IP addresses, if the names can be resolved using the local hosts and networks databases. Having name resolution enabled can hinder logging if names cannot be resolved (for example, if there is a DNS problem).

Use numeric ports, protocols, and ICMP types
Creates reports showing the numeric value for ports, protocols, and ICMP types. Without this option, these fields are translated into the corresponding symbolic value from the **/etc/services** and **/etc/protocols** files. For example, if this option is selected, the report would display port `21` instead of `ftp`, protocol `6` instead of `tcp`, and ICMP type `8:0` instead of `ECHO`.

CAUTION!

Overwriting causes activity records to be discarded, making auditing impossible for those records. You may want to archive **/var/audit_logs/old/** records before they are overwritten.

Notes:

- Logging to these files occurs after you check **File** and click on **Use** on the Alerts, Activities, and Archives window.
- CSMART does not use its own configuration file. The CSMART configuration data is stored in the **/etc/security/firewall/startup.conf** file.

See also:

- **auditlogd(1M)** system manual page
- **auditrpt(1M)** system manual page
- *CSMART User's Guide*
- "Activity Reports Window" on page I-252
- "Alerts, Activities, and Archives Window" on page II-326

Alerts, Activities, and Archives - Underlying Constructs

Advanced Users Only! The GUI automates the editing of files and invocation of commands described in this section. If you choose to manually edit any file, you must first close every window displayed from the **Configuration** menu and complete all edits of the file before continuing GUI configuration activities.

To define the system's response to suspicious events and regular activities:

1. Define suspicious events and the associated system responses in the **/etc/security/cyber/alert.conf** file.
2. Define activities to log to a file in the **/etc/security/cyber/trace.conf** file.
3. Invoke the **/usr/sbin/cyber/auditlogd** daemon to read the configuration files and monitor alerts and activities.

Alerts Configuration File (alert.conf)

The alert subsystem of the CyberGuard Firewall can monitor network activity for sequences of events that are characteristic of an attack or that require administrative attention. When such a sequence occurs, the alert subsystem constructs a message describing the event and delivers the message using any of several different methods.

Use the **/etc/security/cyber/alert.conf** file to identify the events to monitor and the notification method for each event. This file is read by the **auditlogd** daemon when the **-A** option is used.

Format guidelines:

- Alert definitions can span multiple lines.
- Use quotation marks around parameter values that contain white space.
- Comments begin with the # character and continue until the end of the line.
- Follow each event keyword with at least one notification method. Some events have additional parameters that refine the event definition.

Format:

event notification_method [*additional_parameters*]

Event Statements:

access_deny *notification_method* **file=***absolute_path_name*
Access was denied to a file or directory specified with **file=***absolute_path_name*. Use one **file=** keyword for each file or directory that you want to track.

access_grant *notification_method* **file=***absolute_path_name*
Access was granted to a file or directory named with **file=***absolute_path_name*. Use one **file=** keyword for each file or directory that you want to track.

audit_archive *notification_method*
Identifies archiving problems such as the capacity overriding "keep days", high utilization of local destinations, FTP failures, and tar failures.

auditoff_alert *notification_method*
Indicates that auditing has been disabled. The administrator may choose to shutdown the firewall, receive a page, and receive e-mail when this alert occurs. To enable these actions, type the following in the configuration file:

```
auditoff_alert shell_cmd="/usr/sbin/auditoff_alert -s 10
-p  phone_number -m 1*911 -c com_port -r cgadmin"
```

where **-s** is the number of seconds before the firewall shuts down, **-p** is the phone number of the pager, **-m** is the message displayed on the pager, **-c** is the com port of the pager, and **-r** is the user ID to which e-mail is sent at NETWORK level.

Note that every night at midnight, the auditing subsystem switches to the audit file for the next day and turns auditing off for a moment. This generates an **auditoff** event followed immediately by an **auditon** event. Because this is a normal event, the **auditoff_alert** command can be used to take action only when auditing is disabled unexpectedly.**blocked_file** *notification_method*
The content scanning software has identified a dangerous or undesirable file or document and blocked its transmission through the firewall.

disk_space *notification_method* **check=***interval*,*utilization*,*filesystem*
Disk space is low. Use one or more **check=** keywords with the interval (in seconds) specifying how often to check the disk capacity, the percentage of disk space utilization that will trigger an alert, and the file system to check.

failed_logins *notification_method* [**attempts=***number*] [**interval=***seconds*]
Unsuccessful attempts have been made to login to the firewall by the same device or by the same user within an interval (in seconds) of time. The defaults are 3 attempts in a 3600-second interval (three attempts in an hour).

forward_attack *notification_method*
A source-routed packet names a different route from the one the firewall would normally use.

ha_nohb *notification_method* [**interval**=*seconds*] [**attempts**=*number*]
Heartbeat messages have been absent from the served or standby firewall for a specified number of seconds after a specified number of attempts. The default interval is 180 seconds; the default number of attempts is 1.

ha_standby_alt *notification_method*
Indicates that the disk on the standby machine has reached capacity. This alert is generated on the served machine.

ha_standby_dwn *notification_method*
Indicates that the standby machine in a High Availability pair is down. This alert is generated on the served machine.

ha_transition *notification_method*
A transition has been made to or from the "served" (active) or "unknown" state.

host_limit *notification_method* [**interval**=*seconds*]
One or more TCP connections are denied because the number of internal hosts permitted to pass packets through the firewall reached the licensed limit. The default repeat interval is 120 seconds.

interface_spoof *notification_method*
Occurs when the source address of an inbound packet (a packet from the external side of the firewall) is the address of a host on the internal side of the firewall.

land_attack *notification_method*
Discarded packets in which the source address and port are the same as the destination. Land is a widely available attack tool that exploits the vulnerability of many TCP/IP implementations to these particular packets.

mac_violation *notification_method*
Access through an interface was denied due to a MAC failure.

ping_of_death *notification_method*
Discarded packets, often from a **ping(1)** command, that contain an illegal combination of IP fragment offset and IP length and might cause the destination host to crash if allowed to pass through.

prowler_msg *notification_method*
Working with NetProwler, provides notification when a packet-filtering rule is added by the Intrusion Detection System to deny traffic an offending connections.

port_scan *notification_method* [**denials**=*number*] [**interval**=*seconds*]
The **netguard** packet filter denied a specified number of packets with the same source IP address and different destination IP addresses or port numbers within a specified time period. The default is 50 packets within a one-second time period.

sw_update *notification_method*
Automatic updates to the firewall or operating system software through use of the Software Updates window.

tcp_synflood *notification_method* [**timeouts**=*number*] [**interval**=*seconds*]
The **netguard** packet filter encountered a specified number TCP connections that failed due to a timed-out SYN/ACK segment sent from the same server IP address and port number. The default is 10 TCP connection time-outs in a 75-second time period.

vpn_ike_alert *notification_method*
Indicates an issue has occurred with IKE.

vpn_ipsec_alert *notification_method*
Indicates an issue has occurred with IPSec.

vpn_intcpke_alert *notification_method*
Indicates an issue has occurred with an ESP or AH session.

vpn_x917_test *notification_method*
Indicates the VPN pseudo random number generator has generated the same number twice. The FIPS 140-1 standard requires that VPN operation be halted in this unlikely event. Therefore, the operator must investigate and resolve the problem and then manually resume VPN operation.

vpn_cert_alert *notification_method*
Provides information about VPN certificate problems.

Notification Method:

log_file=*absolute_path_name*
Write the message to the named file. You can use any path name and file name; however, the GUI uses default files in the **/var/audit_logs/** directory. See "Default Log Files for Suspicious Event Types" on page II-333 for a list of the default files.

mail_addr=*recipient,level*
Mail the message to the *recipient* with "`Alert message from CyberGuard`" as the subject line. The level must be the MAC level of the recipient, such as **NETWORK**, **SYS_PRIVATE**, or **SYS_PUBLIC** [see **lvlname(1M)**].

num_page='*pager_number***','***pager_message***',***com_port*
Send a numeric message to a pager telephone number.

pipe_cmd="*command_line***"**
Use a pipe to write the message to the standard input of the named shell command. The shell command line is executed by **sh(1)**.

shell_cmd="*command_line***"**
Append the message to the named shell command as a quoted string argument and pass the resulting command line to **sh(1)** for execution.

snmp_trap=*host_address***,***community***,***trap_number***,***message_prefix*
Send the message in an SNMP trap. The alert message is appended to *message_prefix*. See **estrap(1M)** for further information.

To use this alert, you must define packet-filtering rules for SNMP in the **/etc/security/firewall/netguard.conf** file.

syslog=*facility.level*
Send the message to **syslogd**. See **syslog.conf(4)** for a description of facilities and levels.

window
Write the name of the alert to a pipe read by the CyberGuard Firewall's GUI.

The following example shows the layout of the **alert.conf** file.

```
# /etc/security/cyber/alert.conf
#
access_deny log_file=/var/audit_logs/AccessDenied file=/etc/passwd
access_grant mail_addr=secadm file=/var/audit file=/etc/security
disk_space syslog=local0.alert check=30,90,/ check=30,90,/var
failed_logins window log_file=/var/audit_logs/LoginFailed attempts=5 interval=7200
forward_attack log_file=/var/audit_logs/ForwardD shell_cmd="/usr/local/myprog -x"
interface_spoof snmp_trap=1.2.3.4,public,34,Alert window mail_addr=secadm
mac_violation log_file=/var/audit_logs/IFMACerror
ping_of_death num_page='9,,5554273,,,','1*911',1
port_scan log_file=/var/audit_logs/PortScan pipe_cmd="/bin/write secadm"
```

Figure II-121. Alert Configuration File Example

See also:

- "Default Log Files for Suspicious Event Types" on page II-333
- "Pager Numbers" on page II-339
- "Packet-Filtering Rules for Alerts" on page II-340

Activities Configuration File (trace.conf)

Use the **/etc/security/cyber/trace.conf** file to log regular firewall activities. This file is read by the **auditlogd** daemon when the **-T** option is used.

Format guidelines:

- Comments begin with the # character and continue until the end of the line
- Each line begins with an activity keyword

Format:

activity file

Fields:

activity Type of firewall activity to record in the file.

all_packets - All packets encountered by the firewall
permit - Permitted packets
deny - Denied packets
no_match - Denied packets that did not match any rule
logins - Login attempts
session - Session measurements from the firewall
passwd - Password changes
cm_alerts_reset - Alerts reset by the Central Manager

cm_propagate - Configuration files propagated by the Central Manager
cm_mac_failures - Authentication check failure on an encrypted packet
cm_db_password - Changes to the cryptographic keys database password
cm_db_records - Changes to the cryptographic keys database.
cscan - Messages from the content scanning software
clasd - Messages from the Passport One and NTAD daemons
fw_admin - Administrative interface activities
ftp_proxy - Messages from the FTP proxy
generic_proxy - Messages from the Proxy-Writer (generic) proxy
gopher_proxy - Messages from the Gopher proxy
http_proxy - Messages from the HTTP proxy
ldap_proxy - Messages from the LDAP proxy
ept_proxy - Messages from the Load Equalizer and Port Guard proxies
notes_proxy - Messages from the Notes proxy
nntp_proxy - Messages from the NNTP proxy
ra_proxy - Messages from the RealAudio proxy
rlogin_proxy - Messages from the Rlogin proxy
smtp_proxy - Messages from the SMTP proxy
sqlnet_proxy - Messages from the SQL*Net proxy
ssl_proxy - Messages from the Secure Shell
ssl_proxy - Messages from the SSL proxy
telnet_proxy - Messages from the Telnet proxy
x11_proxy - Messages from the X11 proxy
x11_hook_proxy - Messages from the X11 Hook proxy
displayd - Messages from the **displayd** daemon
sockd - Messages from the SOCKS server
vpn_ike_activity - Activities associated with IKE
vpn_ipsec_activity - Activities associated with IPSec
vpn_intcp_activity - Activities associated with ESP or AH sessions
vpn_cert_activity - Activities associated with VPN certificates.

file The absolute path name in which to record the data. You can use any path name and file name; however, the GUI uses default files in the **/var/audit_logs/** directory. See “Default Log Files for Activity Types” on page II-346 for a list of these files.

The following example shows the layout of the **trace.conf** file.

```
# /etc/security/cyber/trace.conf
#
permit          /var/audit_logs/NetguardP
deny            /var/audit_logs/NetguardD
passwd          /var/audit_logs/Passwd
nntp_proxy      /var/audit_logs/ProxyNNTP
http_proxy      /var/audit_logs/ProxyHTTP
```

Figure II-122. Activities Configuration Example

See also:

- "Packet-Filtering Rules Configuration File (netguard.conf)" on page II-43
- "Passport One - Underlying Constructs" on page II-201
- "Default Log Files for Activity Types" on page II-346
- "Central Management" on page I-103
- "SmartProxies - Underlying Constructs" on page III-9
- "SOCKS - Underlying Constructs" on page II-219

Audit Command (auditlogd)

Use this command to enable the **auditlogd** daemon to read the **alert.conf** and **trace.conf** configuration files and monitor firewall events and activities. A SIGHUP signal causes **auditlogd** to reread its configuration files.

If **auditlogd** finds an error in a configuration file, it will write an error message to **/etc/security/cyber/auditlogd.stderr** and continue to use the old configuration. All other error messages are written to the **.stderror** file.

Syntax:

/usr/sbin/cyber/auditlogd [**-n**] [**-N**] [**-A**] [**-T**] [**-S***facility***.***level*] [**-i** *seconds*]

Options and arguments:

-n Print Internet addresses numerically rather than symbolically, thus avoiding name server lookups.

-N Print ports, protocols, and ICMP types numerically rather than symbolically. For example, the report would display port `21` instead of `ftp`, protocol `6` instead of `tcp`, and icmp type `8:0` instead of `ECHO`.

-A Invoke the alerts monitor to read the **/etc/security/cyber/alert.conf** file and perform the specified actions.

-T Invoke the activities monitor to read the **/etc/security/cyber/trace.conf** file and write the specified records to a file.

-S *facility***.***level*
Invoke the activities monitor to read the **/etc/security/cyber/trace.conf** file and write the specified records to **syslogd(1M)**. See the **syslog.conf(4)** system manual page for a description of facilities and levels.

-i *seconds*
If no new audit records have been appended to the current audit file for a time period of *seconds*, this option will cause **auditlogd** to force the kernel's audit buffers to be written to the audit file. The default is 5 minutes (300 seconds).

Notes:

- When **auditlogd** is started with both the **-T** and **-S** options, activity records are sent to the specified files and to and **syslogd(1M)**.
- After a reboot, **auditlogd** is automatically started in the **/etc/rc2.d/S03auditlogd** script. Before a reboot, **auditlogd** is automatically stopped in the **/etc/rc0.d/K01auditlogd** script.

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Glossary

This glossary defines the terms used in the **CyberGuard Firewall** system and this documentation.

activity

Non-threatening occurrence potentially logged to a file. For example:

- Packets permitted
- All login attempts
- Specific *proxy*'s activity

See also "Activity Types" on page II-344.

alert

Automatic system reaction that reports a *suspicious event*. Can do any of the following:

- Writes the event record to an X window and system log file specified in the **/etc/syslog.conf** file
- Logs the event record to a secure file
- Mails the event record to an existing user at a given mail level
- Sends a numeric message to a pager telephone number
- Sends an enterprise-specific *SNMP trap* to a specified SNMP host address and *community*
- Executes a secure program or script

application-level proxy

(Also referred to as a "dedicated proxy server") *proxy* that serves a single protocol. See *circuit-level proxy*.

auditable event

Representation of a single action (system call or network request) that may affect the security of the system. See *network event* and *system event*.

Authentication Header (AH)
An upper level header located between the IP header and the payload within an IP packet. Typically, an AH includes an integrity check value of the transfer-independent contents of the IP packet. An AH is used to ensure the integrity of the IP packet, both the payload and the IP header. It does not provide data confidentiality. The AH transformation is defined in RFC 2402.

authoritative
Name server that contains the most correct information about a *domain* or data received from an authoritative name server.

bastion host
Computer system that is hardened against attacks from outsiders.

broadcast packet
Packet that can be transmitted and read by all hosts on a system. It usually has a *host address* of `0` or `255`.

Blowfish
A symmetric block cipher. Blowfish uses a block size of 64 bits and a key length of 32 to 448 bits.

CAST-128
A symmetric block cipher with a block size of 64 bits and a key length of up to 128 bits. CAST-128 is believed to be very strong. See RFC 2144 for more information.

certificate
A digital document which is used for verifying the identity of the other end of the transmission. Any type of address including domain name, IP, and e-mail addresses can be authenticated using certificates.

Certification Authority (CA)
An entity that issues digital certificates (especially X.509 certificates) and vouches for the binding between the data items in a certificate.

Certificate users (end entities) depend on the validity of information provided by a certificate. Thus, a CA should be someone that the end entities trust, and usually holds an official position created and granted power by a government, a corporation, or some other organization. A CA is responsible for managing the life cycle of certificates and, depending on the type of certificate and the CPS that applies, may be responsible for the life cycle of key pairs associated with the certificates.

certificate chain
Ordered list of certificates in which the first is self-signed and the succeeding certificates were issued by their predecessors.

Certificate Request
A PKCS10 message containing a subject's name and public key that are submitted to an RA or a CA for signing. Also called a Certificate Signing Request (CSR).

Certificate Revocation List (CRL)
A time-stamped list, signed by a CA, identifying revoked certificates and made freely available in a public repository.

Certificate Signing Request (CSR)
Collection of information that a CA can turn into a certificate.

circuit-level proxy
(Also referred to as a "generic proxy server") *proxy* that serves multiple protocols. See *application-level proxy*.

Class D address
A multicast group is identified by a Class D address. Class D addresses range from 224.0.0.0 to 239.255.255.255.

classless network IP address
A network IP address in which the network mask does not stop on an eight-bit boundary; its sub-network mask is not one of 8, 16, or 24 (expressed in bit-count format) or 255.0.0.0, 255.255.0.0, or 255.255.255.0 (expressed in dotted-quad format). The typical dotted-quad form of a classless IP address includes one octet that represents part of the network mask and all or part of the host bits.

classification level
Comma-separated string starting with the name or number of a hierarchical classification level optionally followed by a list of non-hierarchical category names and/or numbers. There can be no blank space (blanks, tabs, etc.) in this list. Only numbers, letters, underscore, and commas are permitted.

community
Group of one or more management stations associated with an *SNMP* agent.

daylight savings time
Alternate time observed in many *time zone*s that permits daytime activities during daylight hours. See also *standard time*.

Data Encryption Standard (DES)
DES is a U.S. Federal Information Processing Standard (FIPS) that defines the Data Encryption Algorithm (DEA). The term DES is also commonly used when referring to the algorithm.

The algorithm itself is a symmetric block cipher with a block size of 64 bits and a key length of 64 bits (of which 8 are parity bits). The controversy surrounding DES key length and design issues has developed many variants of the original algorithm. 3DES (also known as triple DES or TDEA) is the most accepted. DEA and TDEA are defined in FIPS PUB 46-3.

Diffie-Hellman key exchange
A method for key exchange between two parties. This method can be used to generate an unbiased secret key over an insecure medium.

digital signature

By encrypting a digest of a message with the private key, authentication can later be performed by applying the public key to an encrypted digest (digital signature) and comparing the result to the digest of the message.

Distinguished Encoding Rules (DER)

An ASN.1 "tag, length, value" encoding system used to encode certificates and private keys. Files that are DER encoded cannot be read by a text editor.

DNS

See *Domain Name System*.

Domain Name System

Distributed database system that establishes one or more name servers to maintain equivalency maps between *IP address*es and names.

domain

Subtree in the name space hierarchy. The `edu` domain, for example, is the set of all names ending in `edu` or all names that match:

- `*.edu`
- `*.*.edu`
- `*.*.*.edu`

See also *zone*.

dotted-quad address

IP address that consists of four non-negative integers, called *octet*s, separated by periods. (Left octets make up the *network address*. Right octets make up the *host address*.) It is normally in decimal format but can be in hexadecimal or octal format. You can even mix formats within a given address. For example, the following addresses are all identical:

```
127.95.16.12
0x7f.0137.16.0xc
0177.0x5F.0x10.014
```

dynamic NAT

Form of *Network Address Translation*. For outbound traffic, the source address from the internal *IP address* is translated to the registered, external IP address, dynamically allocating a port number. For replying inbound traffic, the destination address from the external IP address is translated to the correct internal IP address. See *static NAT*.

dynamic routing

Convenient but not very secure routing mechanism where routers know primary and alternate routes. It supports the *Routing Information Protocol*. See *static routing*.

Encapsulating Security Payload (ESP)

An upper level IP header that denotes that the contents of the payload are encrypted and possibly also otherwise protected. An ESP may appear after the IP header, after an ESP header or theoretically also elsewhere within an IP packet. An ESP only protects the contents of the payload, not any associated header. Therefore it is possible, for example, to change any field in the header of the IP packet carrying an ESP without causing a security violation. The contents of the ESP header are unknown to anyone not possessing information about the transformation and SA needed to recover the protected data. An ESP may also contain integrity protection. The ESP protocol is defined in RFC 2406.

enhanced pass-through

The Enhanced Pass-Through proxy is not a proxy for a particular service; instead, it listens for connections from external clients on a specified port, connects the client with the least-busy internal server associated with that port, and passes data between the client and server.

event

See *auditable event* and *suspicious event*.

event class

Name (alias) for a collection of *auditable event*s.

external interface

Name of the external network-interface port and its attributes: an external *IP address*, *sub-network mask*, and *host name*.

See *internal interface* and *bastion host*.

firewall

Computer system that is intended to provide security protection and selected isolation between two networks.

forwarder

Name server that handles all off-site queries generated at a site, saving time and money; required if the site is not directly connected to the Internet.

FSM

Firewall Security Monitor role. Privileged user who can monitor but not change the **CyberGuard Firewall** in *read-only mode*.

FSO

Firewall Security Officer role. Privileged user who can run all commands associated with administrative roles (auditor, site security officer, network administrator, security operator, and operator) and firewall-related commands installed on the system. This user is cleared to the **SYS_PRIVATE** and **NETWORK** *security level*s.

FTP

File Transfer Protocol. An application that transfers files between systems.

full name

In the context of user information for the firewall database, this is the user's full name or job function possibly followed by a comma and telephone number. Only letters, numbers, spaces, and punctuation marks (except colon) are permitted.

gateway

Directly connected host.

Gopher

Protocol that includes the **gopher** program that permits file searches and retrievals on other systems.

group

Named set of *IP address*es, *host name*s, network names, network interfaces, and other group names. It can be used as shorthand notation in *packet-filtering rule*s sources and destinations.

H.225

An International Telecommunication Union (ITU) that defines a layer that formats the transmitted audio, video, data, and control streams from the network.

H.245

An International Telecommunication Union (ITU) that is used to exchange signaling information between H.323 endpoints.

H.323

An International Telecommunication Union (ITU) standard that specifies how multimedia terminals, equipment, and services communicate over networks that do not provide a guaranteed quality of service (such as the Internet). H.323 allows users to participate in the same video conference even if they are using different videoconferencing applications. The H.323 session normally consists of the H.225 TCP connection, the H.245 TCP connection, the auxiliary connections such as T.120, and the RTP/RTCP UDP streams carrying audio/video data.

Hash Message Authentication Code (HMAC)

A secret-key authentication algorithm. Data integrity and data origin authentication as provided by HMAC depend on the scope of the distribution of the secret key. If only the source and destination know the HMAC key, this provides both data origin authentication and data integrity for packets sent between the two parties. If the HMAC is correct, this proves that it must have been added by the source.

home directory

Directory where the user is positioned immediately after logging in. It must be on a writable file system and must not already exist when the user is added. It is strongly recommended that all home directories be under **/home** (the default) or **/home2**. Home directories will not be allowed in the root directory, e.g., **/joe**, **/tmp**, nor allowed to be under any directories reserved for system files, i.e., **/dev**, **/etc**, **/export**, **/instal/**, **/sbin**, and **/system**. Note that the **cgadmin** home directory is in **/var**, although this directory is normally reserved for system files.

hops

Number of nodes a router must pass through to reach a destination host or network. The system uses this value to choose the most efficient route. This also is known as the path length. Values include:

1 Direct communications link or both source and destination have connections on the same local area network

2 Packets routed through one intermediary host before reading the destination

n Packets routed through *n*-1 intermediary hosts before reading the destination

host address

Right-most *octet*(s) of a *dotted-quad address*. Class D and Class E addresses, where the first octet is between 224 and 254, inclusive, cannot be used for host addresses.

host name

Name or alias for a system. A list appears in **/etc/inet/hosts** and in the Host Names window.

HTTP

Hypertext Transfer Protocol. A protocol that enables communication between World Wide Web browsers and servers.

HTTPS

Secure HTTP. Security is enforced through the use of SSL.

ID number

Unique integer between 100 and 50000, inclusive. The system uses it to associate files with a user's *login ID*. The default is the first available user ID greater than 100.

The following values categorize users:

1-99 admin. Usually reserved for daemons.

100-50000 user. Has no innate privileges.

interface spoofing

Suspicious event that occurs each time one of the interfaces receives a packet that should not have appeared on that interface. For example, if a packet received on an external interface has a source address of an internal-network machine, an IP spoofing attempt occurred and is logged.

internal interface

Name of the internal network-interface port and its attributes: an internal *IP* address, *subnet mask*, and *host name*. (See also *external interface* and *bastion host*.)

Internet Key Exchange (IKE)

The key-establishment protocol used with IPSec. IKE was formerly called the ISAKMP/Oakley key exchange. The IKE protocol is defined in RFC 2409, RFC 2408, and RFC 2407.

Internet Protocol Security (IPSec)
A protocol suite for protecting IP traffic at packet level defined by the Internet Engineering Task Force (IETF). IPSec can be used for protecting the data transmitted by any service or application that is based on IP. The IPSec protocols are defined in RFC 2401.

IP
Internet Protocol. Often called the "building block of the Internet," IP serves as a base for a number of different protocols, defines the basic unit of transmission across the Internet, defines the Internet addressing scheme, and much more.

IP address
Internet Protocol address assigned to a computer according to its Internet network. The address is a 32-bit number grouped into four sets of eight bits (*octet*s); each octet is converted into a decimal number and separated by a dot. For example, 192.168.3.2. See *dotted-quad address*.

IP payload
The part of the IP packet that carries upper level application data.

ISP
Internet Service Provider. External host that connects the *firewall* to the Internet.

level
See *security level*.

license key
Software mechanism provided by CyberGuard Customer Assistance Center that permits access to optional features and products related to the CyberGuard Firewall.

Lightweight Directory Access Protocol (LDAP)
A protocol developed by the University of Michigan that allows clients to retrieve information about people and objects in the network. CAs can place certificates and CRLs on LDAP directories so that users can retrieve them.

login ID
Name that the user enters to login to the system. The system uses it to uniquely identify the user and the user's files. Only lowercase letters and numbers are permitted. The login ID must begin with a letter. The maximum length is eight characters.

login shell
Name of the user's login shell. Usually this is **/usr/bin/sh**, **/usr/bin/csh**, or **/usr/bin/ksh**. Only numbers, letters, underscore, slash, and comma are permitted. The default is **/usr/bin/sh**.

MTU
Maximum Transmission Unit. The largest physical packet size, measured in bytes, that a network can transmit. Any messages larger than the MTU are divided into smaller packets (fragmented) before being sent, which slows down transmission speeds.

name server

See *Domain Name System*.

NAT

See *Network Address Translation*.

network address

Left-most *octet*(s) of a *dotted-quad address*. Class A network addresses consist of one octet, Class B two octets, and Class C three octets. Normally in decimal format, each octet can be in hexadecimal or octal format. You can even mix formats within a given address. Omitted octets are interpreted as 0s. See also *sub-network mask*.

Network Address Translation

Feature that allows a *firewall* to hide a company's internal network from the outside while allowing network services to be routed through the firewall. See *dynamic NAT* and *static NAT*.

network event

Type of *auditable event*. Representation of a network request that may affect the security of the system. See *system event*.

Network Information Center

Provider of registered external *IP address*es.

Network Interface Card

A network interface card (NIC) is a computer circuit board or card that is installed in a computer so that it can be connected to a network. Network interface cards provide a dedicated, full-time connection to a network.

network service

Operation that occurs between hosts. For example:

- *Telnet*
- *FTP*
- *SNMP*

NIC

See *Network Information Center* and *Network Interface Card*.

NNTP

Network News Transfer Protocol. A protocol that is used to transfer news across the Internet.

node name

Name a communications network calls a system.

non-privileged host

Hosts attached to an *external interface*.

notebook

Related tabbed displays called *pages* that are viewed individually.

Online Certificate Status Protocol (OCSP)

A protocol defined in RFC2560 and used by applications to query OCSP responders in order to find out if a certificate is valid.

octet

Number that represents the unsigned value of an 8-bit byte. The decimal number 255 represents the maximum value of an unsigned 8-bit byte. See *dotted-quad address*.

packet-filtering gateway

Computer system with two network interfaces that allows specific *network service*s to be routed through and others to be blocked based on a set of administrator-defined rules.

packet-filtering rule

Site-defined criterion that determines whether particular packets can pass through the *firewall*. A rule is based on:

- A *network service* and protocol
- A *proxy*
- One or more *rule options*
- The *IP address*es and the service port numbers for the connected originating host and destination host

password

Next security hurdle after the *login ID*. Passwords can be system-generated; the proposed password is made up of two syllables and two digits. Syllables can be two or three characters long; syllables and digits can appear in any order. The intent is to provide a sufficiently large password-space to discourage guessing while providing quasi-pronounceable passwords as an aid to memory.

Perfect Forward Secrecy (PFS)

Refers to the notion that any single key being compromised will permit access to only data protected by that single key. In order for PFS to exist, the key used to protect transmission of data must not be used to derive any additional keys. If the key used to protect transmission of data was derived from some other keying material, that material must not be used to derive any more keys.

PKCS7

A message syntax for sending encrypted and/or digitally signed messages.

PKCS10

A message syntax for certificate requests.

PKCS12

A portable format for storing and transporting private keys and certificates.

PMTU

Packet Maximum Transmission Unit. See MTU.

primary name server

Name server that reads information from files. See *secondary name server*.

Privacy Enhanced Mail (PEM)

A type of encoding for certificates, private keys, and digital signatures. Files that are PEM encoded can be read by a text editor.

private key

In public-key cryptography the private key is only known to the holder, and it can be used to sign and decrypt messages.

proxy

Network service that is executed on the *firewall* on behalf of the corresponding service on a local machine. A proxy service is used so that a more secure *network service* can communicate with another host. For example, instead of using the service that resides on your local machine to communicate with an external host, you can configure the firewall so that internal machines use the service that resides on the firewall. Because the service is performed at the firewall, performance is reduced, but security is enhanced.

See also *Telnet*, *Rlogin*, *SMTP*, and *FTP*.

range

Pair of *security level*s where the upper bound must dominate the lower bound. For example:

- **SYS_PUBLIC — NETWORK**
- **SYS_PUBLIC — SYS_PRIVATE**

read-only mode

Firewall state that permits an *FSM* user to monitor but not change the **CyberGuard Firewall**.

RealAudio

The RealAudio™ client-server application allows for the delivery of streaming audio on the Internet. It allows a user (client) with a RealAudio player to hear audio clips and real-time (including live) audio broadcasts from Internet sites that are running a RealAudio server.

recursive query

Requests to a name server to follow through with resolving referrals to other name servers and reply with the final answer, rather than passing a referral back to the requester of a recursive query. If the correct answer cannot be resolved, an error is returned.

registered domain name

Externally visible name for a *firewall* that is registered with the *Network Information Center*. It has the following types:

- Fully qualified domain has the firewall host name as the node name, and the rest as the registered name
- Multiple-network domain has at least the firewall host name registered if the *ISP* handles *Domain Name System*

remote administration

Central control and monitoring of multiple *firewall*s.

RIP

See *Routing Information Protocol*.

Rlogin

Remote login.

root name server

Well-known server that holds information about high-level, or root, Internet domain hierarchies.

Routing Information Protocol

Popular interior gateway protocol that classifies routers as active and passive. *Active routers* transmit their routes to others; *passive routers* receive and update their routes based on advertisements; they do not advertise. Usually, routers run RIP in active mode, and hosts use passive mode.

rule action

Description of how the *firewall* handles packets. It may be *permit*, *proxy*, or *deny*.

rule option

State flag associated with a rule. For example:

- Enable reply
- Audit these packets
- Time-out in seconds

secondary name server

Name server that gets information over the network from another name server. It shares the load with the *primary name server* or replaces it when the primary is down.

Security Association (SA)

A unidirectional connection created for security purposes. All traffic traversing an SA is provided the same security processing. In the IPSec context, an SA is an internet layer abstraction implemented through the use of an AH or ESP. It contains data controlling how a transformation is applied to an IP packet. The data is determined using specially defined SA management mechanisms. The data may be a result of an automated SA and key negotiation or it may be defined manually. This term is defined in RFC 2401.

security level

Hierarchical *classification level* plus a set of non-hierarchical categories that represent the sensitivity of information. For example:

- **NETWORK**
- **SYS_PRIVATE**
- **SYS_PUBLIC**

security policy

Description of addressed security issues, enforcement rules, review guidelines, people's roles, etc. when it comes to protecting your system. For example, it may include a list of the *network service*s that you wish to allow into and out of the *firewall*.

security parameters index (SPI)

An arbitrary value used in combination with a destination address and a security protocol to uniquely identify an SA. The SPI is carried in AH and ESP protocols to enable the receiving system to select the SA under which a received IP packet will be processed. An SPI has only local significance as it is defined by the creator of the SA, which is usually the receiver of the IP packet carrying the SPI.

service

Port number with a meaningful name such as `telnet`, `ftp`, `smtp`, `nntp`, `who`, or `echo`.

SMTP

Simple Mail Transfer Protocol. A protocol that is used to exchange messages between two mail transport agents, such as **sendmail** programs.

SNMP

Simple Network Management Protocol. Lets administrators efficiently manage, monitor, and maintain local or remote TCP/*IP*-based computer networks. A host receiving an SNMP *trap* must be configured so it can respond to the trap. See **estrap(1M)**, **/etc/netmgt/snmpd.comm**, the *Network Administration* UnixWare online manual, and the SNMP documentation for the foreign host type.

spoofing

See *interface spoofing*.

SSL

Secure Sockets Layer protocol. Provides a method of encapsulating data to allow privacy between two applications communicating over the Internet.

SSL tunneling

Protocol that adds assurance that the proper protocol is in use. It forces an extra handshake between internal SSL clients and the proxy on the firewall.

standard time

Time established by law or custom as civil time. See also *daylight savings time*.

static NAT

Form of *Network Address Translation*. It exposes public servers or public sub-networks on the internal network to the external network, while still hiding the rest of the internal network. It also allows an external host to initiate a connection to a specified internal host or network. For outbound traffic, it translates the internal IP address to an external IP address. For inbound traffic, it translates the external IP address to the specified internal IP address. See *dynamic NAT*.

static routing

Secure but tedious routing mechanism where you define each route. See *dynamic routing*.

subnet mask

See *sub-network mask*.

sub-network mask

Means of modifying the structure of an *IP address* by using some of the *host address* bits as extra *network address* bits. In a mask, `255` means an exact match, and `0` means any number; use `0`s in the rightmost bit positions.

If you are using sub-networks, the sub-network mask depends on the class (A, B, or C) of Internet addresses and how far you want to extend the use of bits in the address for use as a *network address*. A class B address normally provides 16 bits of network address and 16 bits of host address. However, through the use of the sub-network mask of `255.255.255.0`, the upper 24 bits of the address are used as the network address, and the lower 8 bits are used as the host address. For further information on the use of sub-network masks, consult a text on TCP/*IP* networking.

suspicious event

Occurrence that may require corrective action. For example:

- File access failures
- Disk partitions full
- Failed login attempts
- IP *interface spoofing* attempts

See also “Suspicious Event Types” on page II-331 and *alert*.

system event

Type of *auditable event*. Representation of a system call that may affect the security of the system. See *network event*.

system manual page

Terse technical description provided with the operating system. It describes a system command, service, library, or file.

T.120

Suite of communication and application protocols for real-time data connections and conferencing.

TCP SYN flood

A denial-of-service attack that exploits the standard TCP connection establishment protocol. A malicious client forges it's source address to be that of a non-existent host. This causes the responding server TCP to consume resources while waiting for the non-existent host to respond to the server's synchronization packet. This wait can cause the port's backlog to be flooded. TCP will refuse further connections on the flooded port.

Telnet

Telnet Network Login. Application that allows you to login to a remote machine.

time zone

Geographical region that uses the same *standard time*. It has the following parts:

- The time offset from Greenwich Mean Time (GMT)
- The *daylight savings time* rules about its start and end dates and times
- The time zone abbreviation for date and time displays, e.g., **date(1)**

See **timezone(4)** for the format.

token

Hand-held device that produces user passwords for identification and authentication.

trap

Exceptional condition notification sent by SNMP.

trusted gateway

ISP or internal router acting as a routing-information source in dynamic routing.

Twofish

A strong and fast block cipher. Twofish uses a block size of 128 bits and a key length of up to 256 bits.

Virtual Private Network (VPN)

Virtual private networking is the use of encryption in the lower protocol layers to provide a secure connection through an otherwise insecure network, typically the Internet.

WWW

World Wide Web.

X11

X Window System. Protocol that allows remote access to graphical resources.

zone

One level of a subtree in the name space hierarchy. The *edu* zone is the set of all names that match `*.edu`. A zone is different from a *domain* in that it is one level in a domain. `uclink.berkeley.edu` is not in `edu`'s zone but `berkeley.edu` is.

zone of authority

Refers to the name space a name server contains authoritative information for. For example, the name server for *berkeley.edu* would not be authoritative *.*com* or *.*mil* but would be authoritative for names matching *.*berkeley.edu*.

zone transfer

Copying of zone information that occurs when a *secondary name server* requests this information from a *primary name server*.

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